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MBER 18, 1946
ME 35, No. 23

AMERICAN
DYESTUFF REPORTER

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Three of a kind -

Solophenyl* Browns G L, R L and B G L Extra give the dyehouse a wide range of true direct dyeing Browns possessing the extreme in light fastness.

Mills producing fabrics requiring the ultimate in light resistance, either on Cotton or Rayon, will find these three Solophenyl Browns to be ideally suited.

*Reg. U. S. Patent Office

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Geigy
Dyestuff Makers Since 1859

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COLORISTS

PROVIDE SUPERIOR...LASTING SOFTNESS WITH DECERESOL 1861

DECERESOL* 1861 Softener is a durable type softener composed of surface active colloids and possessing a high degree of compatibility. At optimum concentrations it imparts superior softening with a soft, silky, but not raggy hand to woolens, cottons and rayons as well as to other yarns and threads. DECERESOL 1861 reduces bleeding of direct colors, decreases crocking of napthol colors and inhibits gas-fading tendencies of certain acetate colors. In warm water solutions, ordinary stirring produces good dispersion and stable suspension.

Write today for more detailed information as to general properties and methods of application.

Check These Special Properties of DECERESOL 1861

- Compatible with gums, starches, acids, solvents, and dilute alkalies (less than 1% NaOH); also with sulfonated oils and casein solutions in proper ratios.
- Excellent for yarns, fabrics and for knit goods where maximum elasticity is desired.
- Retains softening properties after repeated washing, dry cleaning of fabric.
- Will not discolor white goods when specified concentrations are applied.
- Yields greater resistance to hot-iron scorching than many cationic softeners.
- Will not develop odors on goods. White goods will not retain chlorine after bleaching.
- Possesses wetting ability, normally making use of additional wetting agent unnecessary.

AMONG CYANAMID PRODUCTS FOR THE TEXTILE INDUSTRY ARE... Penetrants, Softeners, Finishes, Sizing Compounds, DECERESOL* OT Wetting Agents, PARAMUL 115 Water Repellent, and other Specialties and Heavy Chemicals**

*Reg. U. S. Pat. Off. **Trade-Mark

AMERICAN Cyanamid COMPANY *Industrial Chemicals Division*

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COPRANTINES
For dyeing acetate and rayon blends that meet modern fastness requirements (particularly in dark shades), use COPRANTINES on the rayon, the new dyestuff range that combines both wash and light fastness.
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ETERNALURE* D-15

The *Single* Resin Finish *for* Nylons *for the Life of the Hose!*

ETERNALURE D-15 requires no changes in equipment or operations. It is applied in rotary or paddle machines in the usual manner to give you highly satisfactory dulling along with greatly improved hand and body, and vastly improved snag resistance. Hose can be handled with a minimum of pull threads.

Eternalure D-15 imparts adequate body to 15-20 denier hose for easy handling after boarding.

This new water-dispersed insoluble resin finish exhausts out of the bath onto the hose because of its affinity for nylon. It imposes no hazards of toxicity or flammability. Its effects last for the life of the hose.

Want a plant-scale test?
It's yours for the asking!

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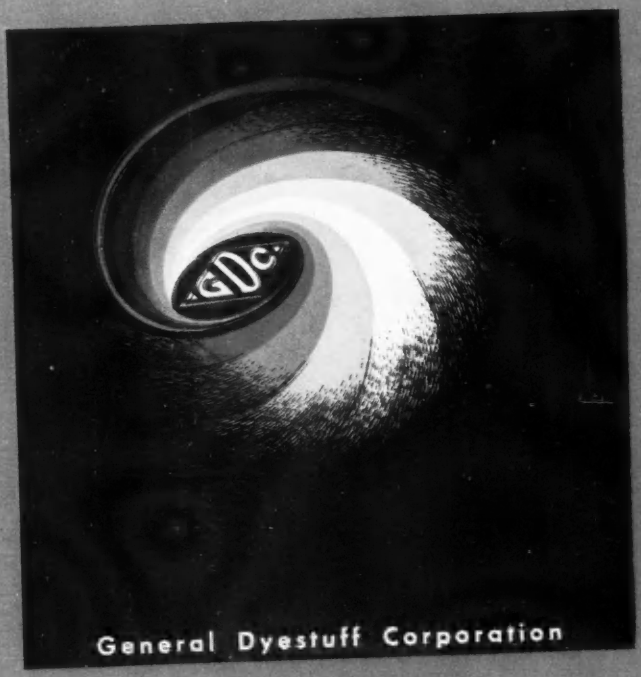
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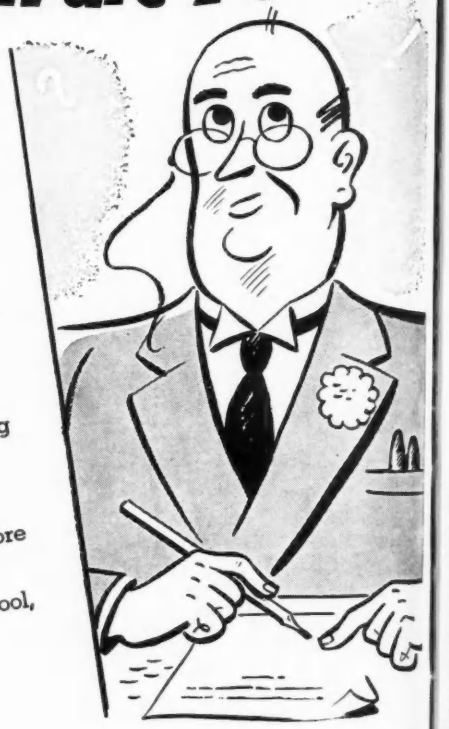

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how many of your employees are buying U.S. Savings Bonds regularly

HERE'S HOW YOU RATE
according to national averages

- ☐ **90%** or more ➡ No one needs to tell you anything about selling.
- ☐ **80%** or more ➡ Excellent.
- ☐ **70%** or more ➡ Not bad. Just apply a little more effort.
- ☐ **60%** or less ➡ This wasn't a high mark in school, either.

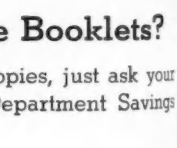
The "PRODUCT"—U. S. Savings Bonds—is easy to sell, because it offers every prospect a guaranteed means of making money. Each unit can produce $4 for every $3 of purchase price.

The MARKET consists of all your employees. It is an eager market, as shown by surveys—which indicate that 85% of all participants in the Payroll Savings Plan want the plan continued.

The REWARD is twofold: By helping your employees build personal security, you help assure that they will be happier, more stable—more productive on the job. And you help *all* of us, including yourself, because every Bond you sell helps to check inflationary tendencies.

Are You Using These Booklets?

If not, or if you wish additional copies, just ask your State Director of the Treasury Department Savings Bonds Division.



THE PEACETIME PAYROLL SAVINGS PLAN—A booklet, published for key executives by the Treasury Department, containing helpful suggestions on the conduct of your payroll savings plan for U.S. Savings Bonds.

THIS TIME IT'S FOR *YOU*—A booklet for employees . . . explaining graphically how the payroll savings plan works . . . goals to save for, and how to reach them with Savings Bonds.

The Treasury Department acknowledges with appreciation the publication of this message by

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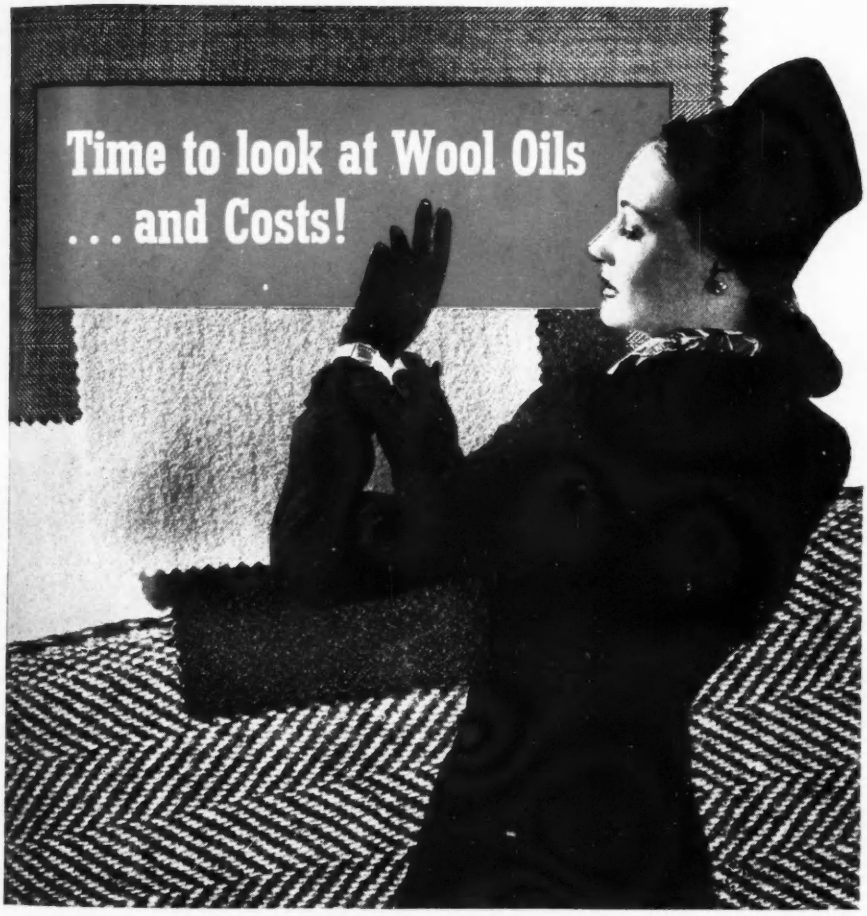

S/V Woolrex Oil Can Save You Money Several Different Ways!

With production costs higher than ever before, it will pay you now to re-examine your wool oils and the costs that they effect.

For example, how long are your card runs before stripping and how many "ends down" per hour occur in the spinning department? It is not good business to use a gum-forming, poor-fibre lubricant that reduces production in both departments.

You're not gaining anything with a low-priced, poor-scouring wool oil that requires excessive amounts of high-priced soaps or "special detergents" to remove. Nor is it logical to use small amounts of an abnormally high-priced wool oil and expect it to card, spin and adequately scour out without any soap!

The answer is the proper grade of S/V Woolrex Oil for *your stock* for maximum card runs, minimum number of "ends down," low soap costs, clean cloth—*saving in over-all costs* in three departments!

* * *

The proper grade of S/V Woolrex Oil is readily available for your mill by calling on one of our offices.

Better, Lower-Cost PROCESSING for ALL Textiles

WOOLENS
S/V Woolrex Oils

Improve carding and spinning. Scour out easily.

★

WORSTEDS
S/V Worstex Oils

Lubricate stock uniformly, improve spinning.

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Special S/V Products

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FINISHING
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Insure quick, uniform re-wetting during sanforized processes.

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Lubricate, soften and deluster rayon fibers.

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Special Oils, Waxes

Provide waterproofing, lubrication and softening.

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Prevent fungus growth and increase fabric life.

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THE LEADING PRE-WAR SILK SOAKING OIL FOR HOSIERY TRAM

MAXIMUM LUBRICATION is again assured for tram—and a CLEAR REGULAR STITCH for hosiery

Before the war, Nopco Direct No. 1 (1854-X) was the largest selling silk soaking oil for hosiery tram—impressive proof of quality far above average. Nopco Direct No. 1 today offers the identical yarn-improving advantages which made it the favorite soaking oil of leading Throwsters and Knitters.

How Nopco Direct No. 1 (1854-X) Helps Improve Hosiery Tram

MAXIMUM LUBRICATION. Nopco Direct No. 1 contains an exclusive additive, which insures complete lubricity for every filament.

CONTROLLED SOLUBILITY. Nopco Direct No. 1 permeates the sericin or gum *thoroughly* and softens it *uniformly*. Result—yarn exceptionally well conditioned for more effective throwing, coning and knitting.

GREATER YARN PLIANCY. The thorough external and internal gum-softening action of Nopco Direct No. 1 leads to the following product benefits . . . better loop formation in knitting, insuring a clear, even stitch. Yarn of this type produces a stocking with less roll on the machine—and in the final phase, easier looping and seaming.

GREATER ECONOMY. Nopco Direct No. 1 —combined with recommended alkalies—is almost 100% exhausted from the soaking bath and into the soaked yarn.

To get a more complete picture of how Nopco Direct No. 1 (1854-X) can help bring peak quality to your silk yarn, write for interesting, informative booklet.

NATIONAL OIL PRODUCTS COMPANY, Harrison, N. J.

Branches: Boston • Chicago • Cedartown, Ga. • Richmond, Calif.

NOPCO EVOLVED THROUGH RESEARCH

REG. U.S. PAT. OFF.

NOPCO DIRECT NO. 1

SILK SOAKING OIL

what do you mean, a new fabric?

It was only a short while ago when there were only four major fabrics . . . woven from the four natural fibers: cotton, linen, silk and wool. Then rayon, the synthetic fiber was produced, and the industry learned how to weave and blend rayons.

Today Monsanto, in Resloom, has developed a unique new melamine resin. This new textile chemical is fused inside the core of any natural or synthetic fiber. The result of this treatment creates such amazing new improvements and such valuable new characteristics that actually a range of new fabrics is made possible.

For example . . .

. . . Resloom treatments on rayon dress fabrics make them *permanently crush resistant, shrink resistant and stable.* Yet the fabrics look and feel exactly like the original. Resloom is unaffected by wear, washing or dry cleaning. Resloom is there for the life of the fabric, imparting *lasting character* to the garment.

Moreover, Monsanto exercises complete control over the standards of materials and carefully selects the firms handling Resloom treated products. In other words, no low grade materials or methods will be allowed the "improvement" by Resloom. Your assurance and your guide to finding these wonderful new serviceable fabrics is the colorful Resloom tag . . . to be found in more and more leading stores all over America.

For full information on Resloom and the new fabrics that it's helping create, write: MONSANTO CHEMICAL COMPANY, 140 Federal Street, Boston 10, Mass.

Resloom: Reg U. S. Pat. Off.

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CHEMICALS AND PLASTICS
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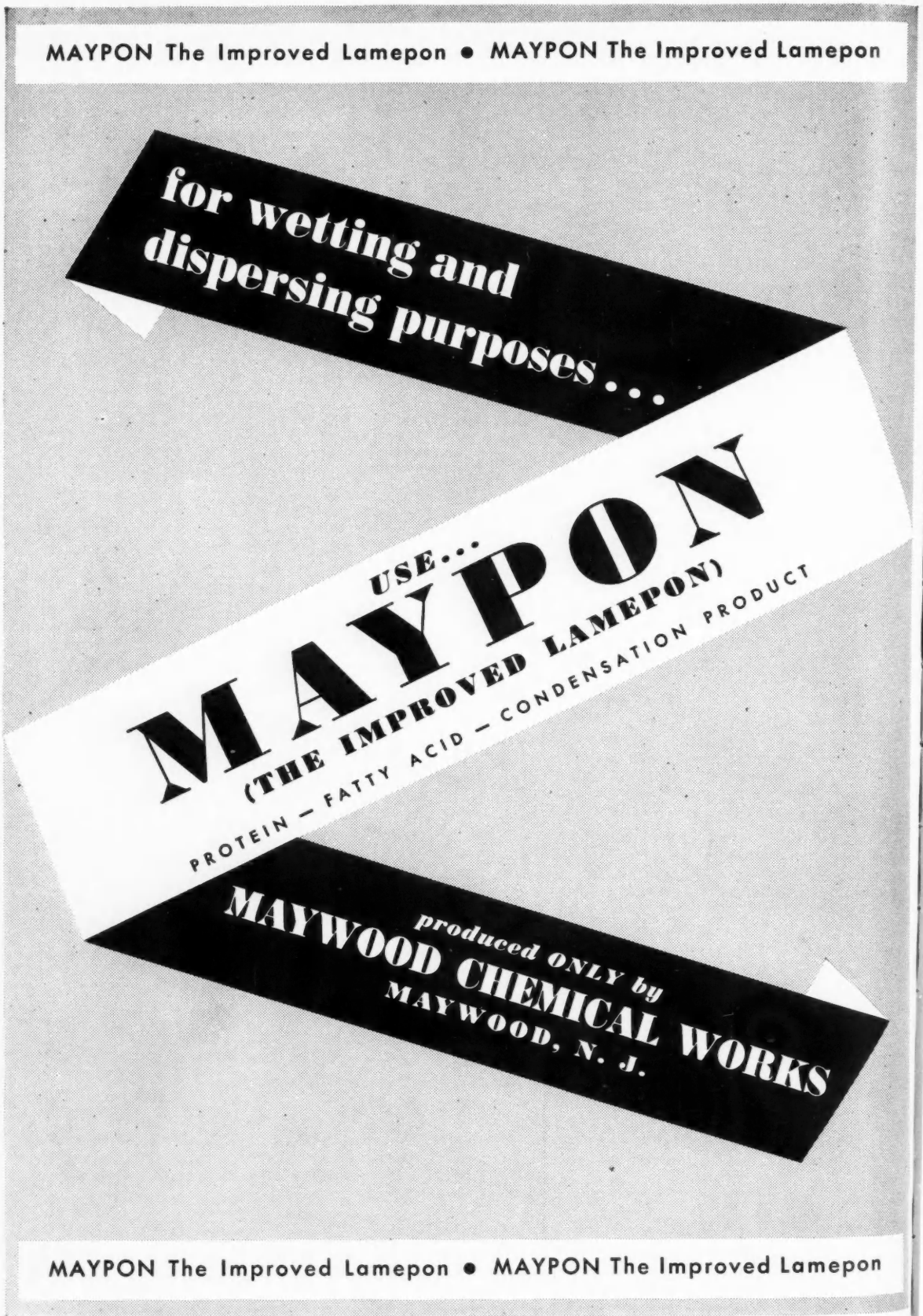
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produced ONLY by
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EASTMAN FAST VIOLET 5RLF

For Light-Fast Dyeing of Acetate Rayon and Nylon

EASTMAN FAST VIOLET 5RLF, an anthraquinone dyestuff, is one in a line of colors which have been developed with exceptional fastness to sunlight. On acetate rayon, this dyestuff produces a bright, clear red violet; pastel shades have twenty-five to forty hour light-fastness. It dyes nylon a somewhat bluer shade, and is one of the best acetate dyes for producing light-fast shades on nylon.

Eastman Fast Violet 5RLF dyes at temperatures ranging from 160°F to 190°F. It exhausts rapidly and levels well, and it is recommended for either jig or box dyeing.

The LF series to which this dye belongs is part of a wide variety of Eastman Acetate Dyestuffs for the dyeing of cellulose acetate rayon fibers and the fabrics in which they are used. Additional information on their application to synthetic fibers may be obtained by writing to the TENNESSEE EASTMAN CORPORATION (Subsidiary of Eastman Kodak Co.), KINGSPORT, TENNESSEE.

Eastman

ACETATE DYESTUFFS

It's the FINISH that Counts!

At a swimming meet or in today's textile market, the race is won at the *finish.* Hosiery, in fact *all* textile products, to keep in the sales swim, must have a winning appearance.

Whether your finishing problems be nylon, cotton, silk, wool or rayon, you can rely on Fancourt to solve them. A letter or phone call today will help you avoid finishing problems tomorrow.

Hydropel—A concentrated, finely dispersed wax emulsion. Used as wax finish or as two-bath water repellent . . . compatible with anti-mildew compounds.

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PHILADELPHIA, PA.

In the South, Howard A. Virkler, Greensboro, N. C.

Solving Finishing Problems Since 1904

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From basic raw materials, National Aniline alone makes every class of aniline dye and color. . . offers America's oldest and broadest color application experience.
by John Frede
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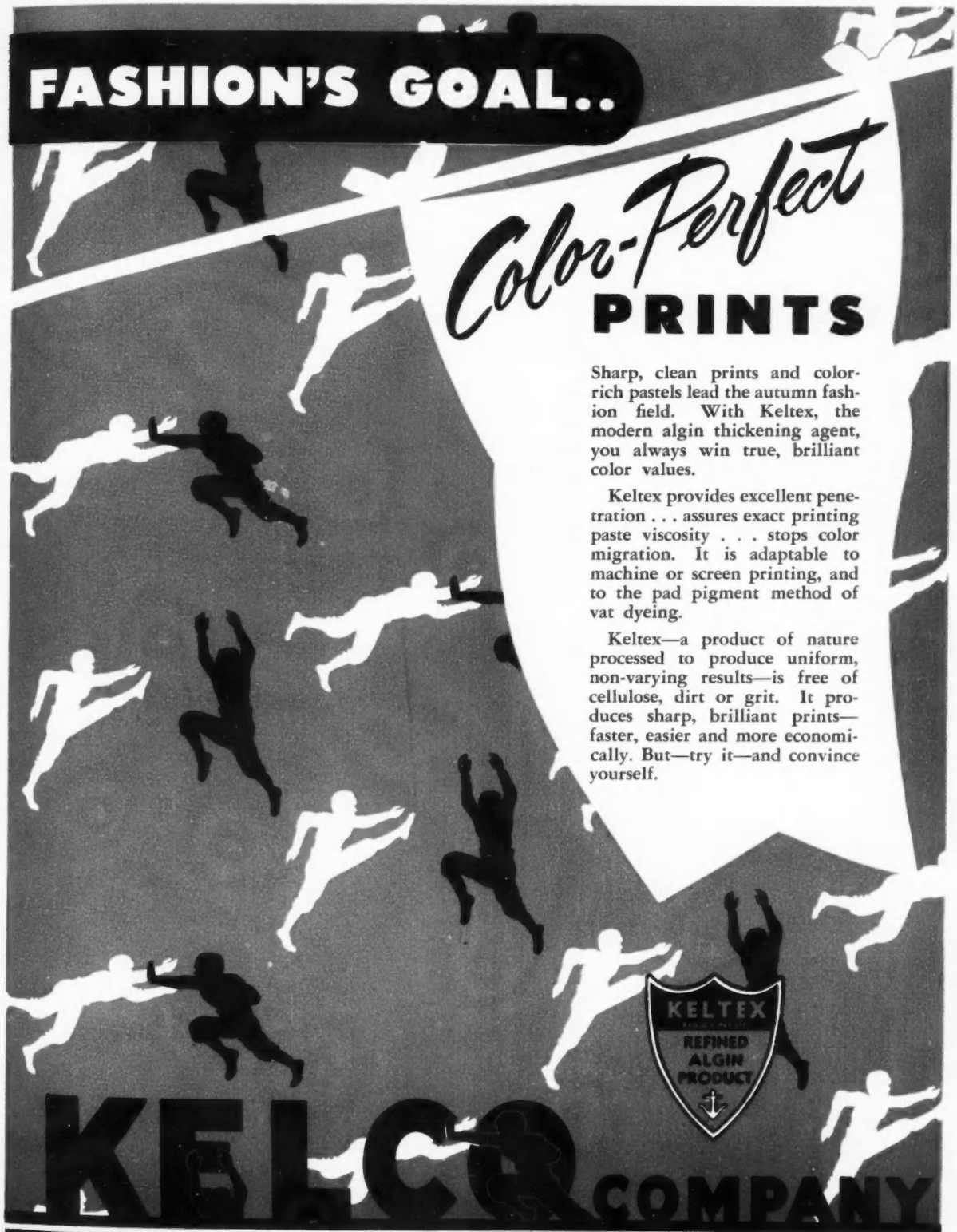
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Sharp, clean prints and color-rich pastels lead the autumn fashion field. With Keltex, the modern algin thickening agent, you always win true, brilliant color values.
Keltex provides excellent penetration . . . assures exact printing paste viscosity . . . stops color migration. It is adaptable to machine or screen printing, and to the pad pigment method of vat dyeing.
Keltex—a product of nature processed to produce uniform, non-varying results—is free of cellulose, dirt or grit. It produces sharp, brilliant prints—faster, easier and more economically. But—try it—and convince yourself.
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ATCO RESINS

#400 AND #150

UREA-FORMALDEHYDE RESINS

WE'VE USED 'EM...
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ASK the plants who use them (and they are many) and they'll tell you that ATCO RESINS are tops for use in *shrinkage control, permanent finish* and *creaseproofing.*

You'll hear how any desired hand, stiff or soft, can be obtained by balancing the two ATCO RESINS.

ATCO RESINS are easily soluble, cure readily, have no odor and assure excellent finishes.

ATCO RESINS can be used for T.B.L.

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Atlantic Chemical Co.

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2 good CHEMICALS for COTTON

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SODIUM HYDROSULFITE

$Na_2S_2O_4$

VIRGINIA Hydrosulfite is a concentrated, white, stable, free-flowing uniformly crystalline powder, readily soluble in water. 100 lbs. of water at 68° F. will dissolve 21.8 lbs. $Na_2S_2O_4$. Easy and complete solubility, and carefully controlled particle size recommend VIRGINIA "Hydro" as a preferred reducing agent for vat dyeing and stripping. Shipped in air-tight steel drums, 250 lbs. net weight.

Shipment will be made from West Norfolk, Va., in Carload and Less Carload lots; L. C. L. shipments from stocks in Boston Chicago, New York, Philadelphia, Charlotte and Atlanta.

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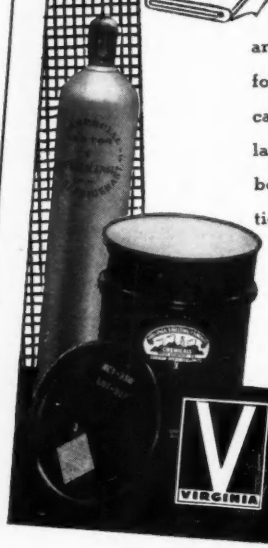
Liquid SO_2

VIRGINIA "ESOTOO" is an ideal antichlor. Its popular adoption has followed the development of a practical semi-automatic method for regulating SO_2 concentrations in the sour box. Write for a complete description of the VIRGINIA method.

VIRGINIA "ESOTOO" is shipped in steel cylinders 150 lbs. net weight.



VIRGINIA SMELTING COMPANY

WEST NORFOLK, VIRGINIA

New York • Philadelphia • Boston

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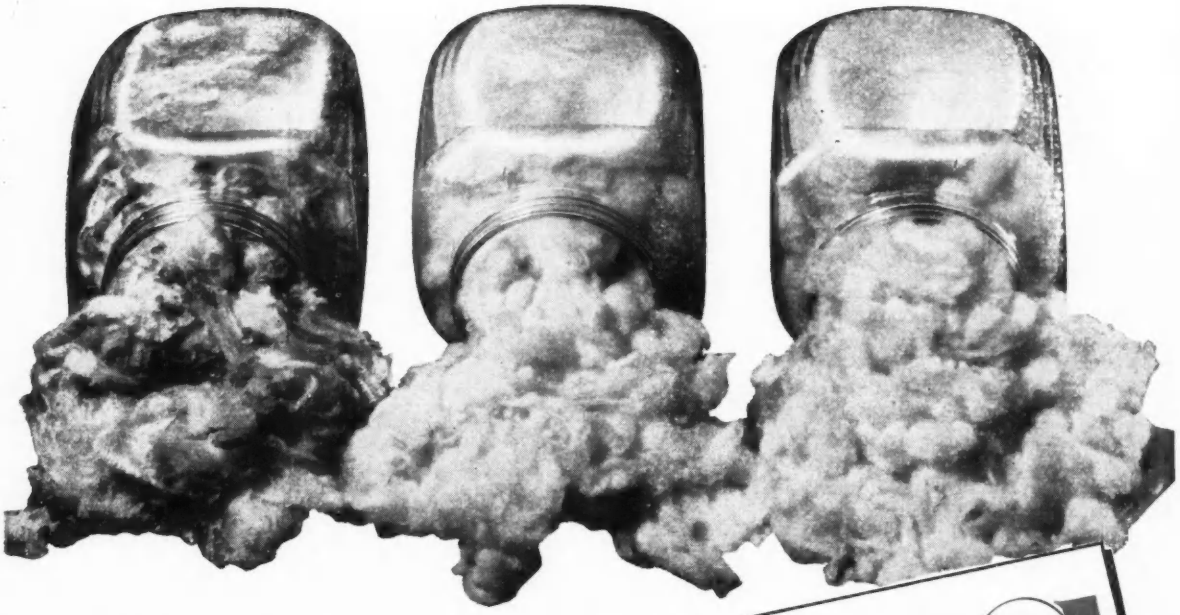
The Water Conditioner

THAT CONDITIONS WOOL, TOO!

QUADRAFOS in the scour produces brighter, loftier wool of superior handle and odor.

Wherever soap is used in textile processing, as well as in dyeing, sizing and printing, QUADRAFOS offers advantages that match its wool-scouring power.

Mill men will tell you that QUADRAFOS is in a class by itself when it comes to scouring Cape, Texas and lime-pulled wools. The difference can be seen, felt and smelled. QUADRAFOS-treated wool looks as if it were bleached . . . feels more open, softer and loftier . . . has little or no odor as compared with soap-and-alkali-scoured wool.



Left—unscoured wool; *Middle*—regular soap and alkali scour; *Right*—QUADRAFOS, soap and alkali scour. The addition of 10% QUADRAFOS calculated on the original soap charge makes possible 25% reduction in soap with improved results.

WRITE FOR COMPLETE DATA

Interesting facts about the non-precipitating water-softening, deflocculating, emulsifying, detergent properties of QUADRAFOS . . . and how they improve textile processing and dyeing, are yours for the asking. Write today to the Rumford Technical Service Department.

QUADRAFOS

U. S. Reg. Trade Mark for Sodium Tetraphosphate made by Rumford

RUMFORD CHEMICAL WORKS

20 Newman Ave., Rumford 16, Rhode Island

...SPOTTING
...WHITE EDGES
...STREAKING

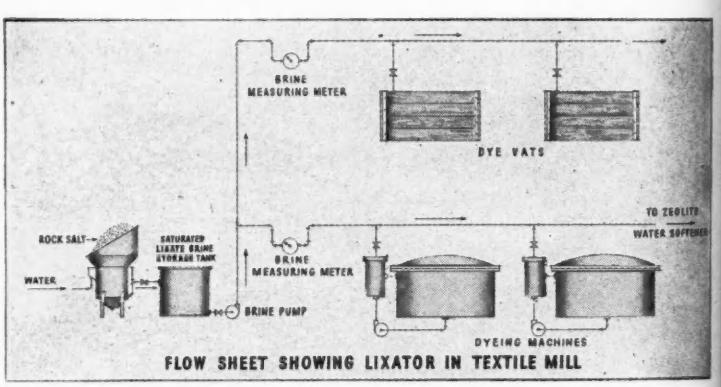
with LIXATE BRINE!

...it's the perfect dye exhausting agent

You can put an end to a common cause of uneven dyeing by using 100% saturated Lixate brine instead of dry salt as your dye exhausting agent. Since Lixate brine is salt in liquid form it will give you better results and improved quality—for when added to the dye bath it is *immediately* diluted and dispersed throughout. This *stops* spotting, white edges or streaking due to the concentration of salt in one spot.

Lixate brine helps to maintain uniformity of shades and colors in different batches for it is always 100% saturated as each gallon of Lixate brine contains 2.65 lbs. of salt—and dilution to any desired degree is easy and accurate.

Due to the uniform distribution of Lixate brine very excellent and desirable results are obtained by adding 5-10% Lixate brine to the final rinse. In hosiery this stops bleeding. Raw stocks dry better, card better, spin better with less breakage and waste due to fuzz loss. Yarn and cloth generally work better.



FLOW SHEET SHOWING LIXATOR IN TEXTILE MILL

The same brine from the Lixator serves both your dye vat or machine and your Zeolite Water Softener. Made from Sterling Rock Salt, Lixate brine supplies 100% saturated, crystal clear brine which exceeds the most exacting chemical purity requirements. Your Lixator and rock salt storage may be located conveniently near your railroad siding—with brine *piped* throughout your plant. Write for further particulars today.

"We're sticklers for level dyeing, and that's why we use Lixate brine,"

declares W. G. HIGGINS, Executive Vice-President, United Piece Dye Works, Lodi, N. J.

Our 26-page free booklet, "The Lixate Process for Making Brine," gives dozens of reasons why you, too, should use Lixate brine in your dyeing. Send for it today:

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*Firm*_____

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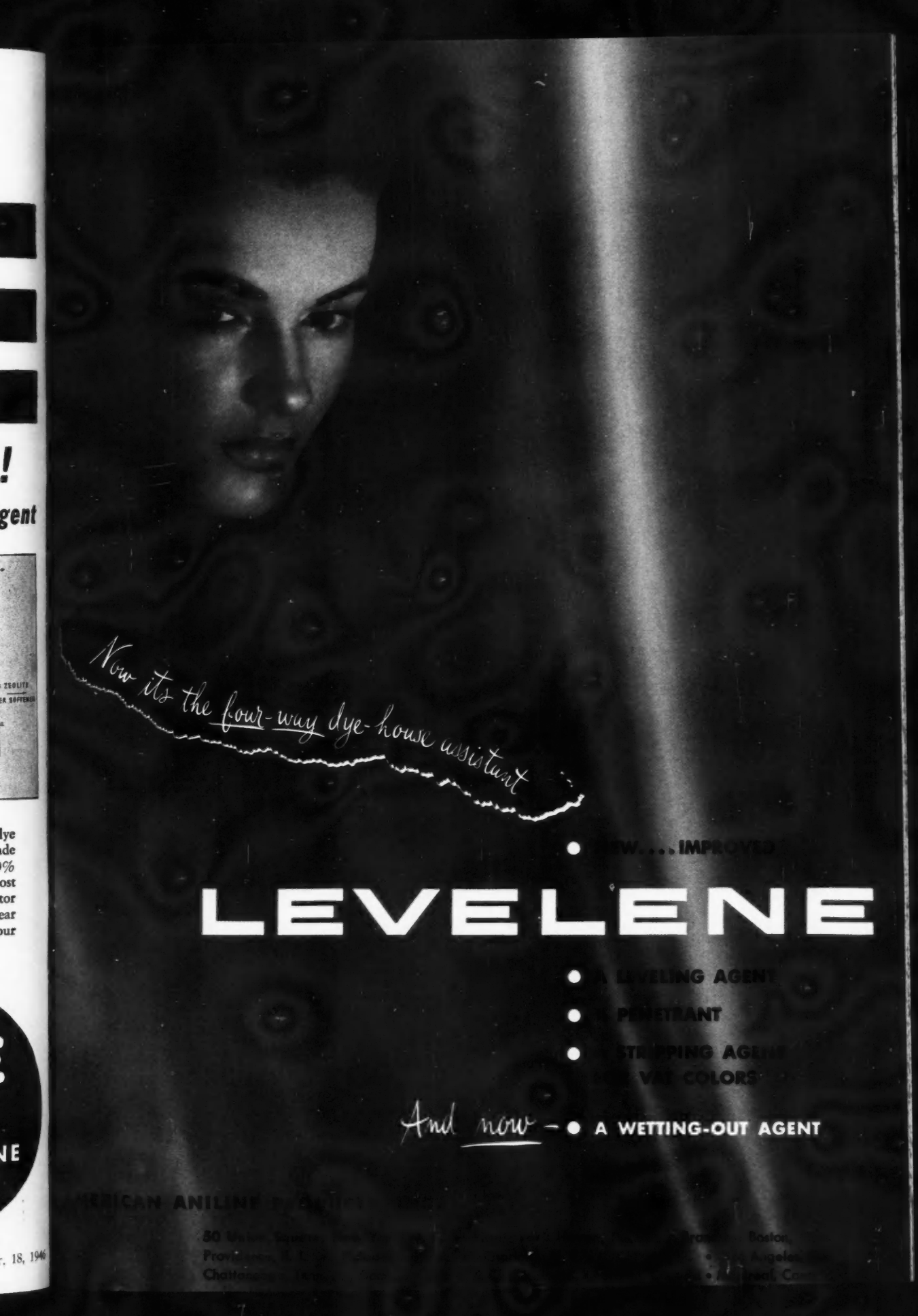
*City*_____ *State*_____

The LIXATE *Process* FOR MAKING BRINE

★ ★ ★

INTERNATIONAL SALT COMPANY, INC
Scranton, Pa.


Now its the four-way dye-house assistant
NEW . . . IMPROVED
LEVELENE
A LEVELING AGENT
A PENETRANT
A STRIPPING AGENT
FOR VAT COLORS
And now — A WETTING-OUT AGENT

FOR INSTANT WETTING...

WETSIT

Available In These Concentrations:

WETSIT SINGLE • **WETSIT WP LIQUID**

WETSIT EXTRA • **WETSIT W-1086M**

WETSIT W-1235 (Solvent Soluble) • **WETSIT CONC.**

• This improved synthetic surface-active agent reduces surface tension, increases penetration, and overcomes the weakness of soap. Its use saves time in processing, reduces cost of detergents, and assures an improved and uniform finished product.

A clear liquid. Wetsit is completely soluble in water in any proportion. It will not injure the most delicate fabric and can be removed with a minimum of rinsing. Efficient, low in cost. Wetsit is available in various concentrations for different purposes.

Write for free samples.

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JACQUES WOLF & CO.

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WAREHOUSES: Providence, R. I., Philadelphia, Pa., Utica, N. Y., Chicago, Ill., Greenville, S. C., Chattanooga, Knoxville, Tenn.

Protect acetate colors from Gas and Fume Fading

VELVAMINE GF

Produces a soft mellow finish!

Velvamine GF is a blend of amines and softeners designed to protect acetate colors from gas or fume fading. It resists removal by drycleaning and, when used on mixed fabrics, has a minimum effect on the shade and light fastness of the direct colors

Velvamine GF produces a soft, full hand and does not affect the appearance of the treated fabrics.

Velvamine GF is compatible with resins, gelatine, glue, starches, dullers and similar finishing compounds.

REFINED PRODUCTS COMPANY
Lyndhurst • New Jersey

*** Manufacturers of PERMA-CIDE, the approved, outstanding, mildew-proofing agent**

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CLARENCE E. MOSS, 19 Wilson Ave., Rumford (16) R. I.

Canadian Selling Agents: Berkeley Products Canada, Ltd., 41 Hillcrest Avenue, St. Catharines, Ontario, Canada
Exporting Agent: Chem-Col Company, 82 Wall St., New York City

Brightness and Economy are Characteristics of

Pharmasol Golden Yellow N

PHARMASOL Golden Yellow N produces clear, bright, fast and economical golden yellow shades when printed on cottons or rayons.

When mixed with Pharmasol Red RN, a complete range of Gold Shades can be obtained.

PHARMASOLS are solutions of stabilized azoic dyes and adjusted to the most practical concentration which can be easily applied with a maximum of efficiency.

PHARMASOLS solve the problem of troublesome dissolving and the uncertainties thereof—and as there is no decomposition there can be no loss of material or value.

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3 amines FOR emulsions AND detergents

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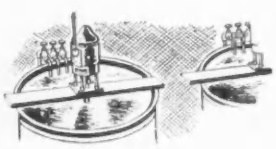

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DYESTUFF REPORTER

VOLUME 35 NOVEMBER 18, 1946 NUMBER 23

A Review of the Literature on
Color Lakes

WARREN B. BLUMENTHAL
The Titanium Alloy Manufacturing Co.

Introduction

THE ASTM has defined a lake as "A special type of pigment consisting essentially of an organic soluble coloring matter combined more or less definitely with an inorganic base or carrier. It is characterized generally by a bright color and a more or less pronounced translucency when made into an oil paint." *(530)*. "Under this term are included two (and perhaps three) types of pigment: (a) the older, original type composed of hydrate of alumina dyed with a solution of the natural organic color, (b) the more modern and far more extensive type made by precipitating from solution various coal tar colors by means of a metallic salt, tannin or other suitable reagent, upon a base or carrier either previously prepared or coincidently formed, and (c) a number combining both types in varying degrees, might be regarded as a third class." (Ibid.).

The literature on lakes covers a considerably wider variety of substances than covered by this definition, and in this survey we shall review the subject of lakes in its widest sense with the object of getting a comprehensive picture of all theoretical and practical aspects of pigment lake technology. We will include in our purvue:

1. Coloring matter precipitated with metals or metallic compounds.
2. Coloring matter precipitated with non-metallic agents.
3. Insoluble coloring matter associated with substrates or extenders which have no precipitating action on the coloring matter.
4. Soluble lakes, which are either soluble metallic compounds with highly colored organic groups, or color lakes of class 1, which have been peptized and behave as soluble dyes.

PREFACE

The literature surveyed and summarized in this report comes from a wide variety of sources, and many of the smallest details are derived from a large number of patents and other literature sources. To avoid excessive interruption of the general exposition of the subject, an index to the literature has been compiled on a subject and author arrangement, and the source of any detail in the body of the report can be found by referring to the literature index and the bibliography. Only in cases where the indexing of the item under discussion might not be obvious is the reference given directly in the body of the report.

The name lake is said to derive from the name of the insect Coccus laccae which infests certain trees and terminates its own life by imbedding itself in a resinous secretion from which both shellac and the coloring matter lac-dye are derived (contains laccainic acid, $C_{16}H_{12}O_8$ (555)). The Indian word root "lakh" or "lac" means a hundred thousand and was descriptive of the enormous numbers in which the lac insect appeared at certain seasons in the branches of the trees *(548)*.

The manufacture of lakes is an extremely ancient art. While the tendency of organic colors to fade has left us with few samples of ancient lake-making art, a pink madder lake and a yellow lake have been discovered among the pigments of the ancient Egyptians. *(550)* However, until modern times the art of lake making was largely in connection with dyeing, where the lake is formed in intimate contact with a fiber, which is thus dyed. The formation of madder lakes on cloth was carried out many centuries ago in India whence it spread to the western world, reaching France and England in the latter part of the eighteenth century. The madder plant itself, with its earthy incrustations, furnished enough alumina to give the color lake. The fatty matter in milk served the purpose later filled by sulfonated oils in bringing out the full richness of the shade. *(552)* The ancients found that a cloth dyed with Tyrian purple (a dye secreted by a snail-like shellfish) became fast crimson when washed with soap, i.e., with alkali. *(544)*

In the broader sense, all dyeing is a lake making phenomenon, and the fields of dyeing and lake-making overlap in such a way that the one cannot be considered without involving the other. This is brought out more forcibly by the fact that not only is most dyeing done on mordants, which are substrates for lake formation, but the first so-called direct or substantive dye (Congo red) was not discovered until 1884. Prior to this, cotton could be dyed with acid and basic dyes only through use of a mordant; moreover, substantive dyes on cotton are in general much less fast to light than the mordant colors. *(552)*

Until the development of coal tar dyes numerous animal and vegetable dyes were used in the manufacture of color lakes. (Animal: cochineal, lac-dye, alkermes, Indian yellow, purple snail, etc.; Vegetable: logwood, fustet, quercitron, indigo, redwood, etc.) *(548, 555, etc.)* With the development of coal tar colors, the synthesis of the older dyes and the develop-

ment of many new types of dyes, color lake manufacture was given a tremendous impetus. Of particular importance were the development of diazo compounds by Peter Griess between 1858 and 1866, the filing for patent of a cheap process for making alizarin from anthracene in 1869 by Graebe and Liebermann (and by Perkin one day later), and the discovery and development of the triphenylmethane dyes by Hoffman (1858) and Verquin (1859). *(529, 537, 544)*

The most important group of coloring matters used in modern pigment and lake manufacture is the azo group. The parent substance of all azo colors, azobenzene ($C_6H_5.N:N.C_6H_5$) has been known since 1834. The first of this type compound to be produced in large quantity was aminoazobenzene, in 1863 by Simpson, Maule and Nicholson. It was produced by the action of nitrous gases on aniline dissolved in alcohol and was known on the market as anilin yellow. The first industrial application of Griess's discovery of the diazo compounds was the manufacture of chrysoidine (diamino-azobenzene, an orange coloring matter discovered independently by Caro and Witt in 1876, and making its commercial appearance the same year. *(548)*

In the late nineteenth century and early twentieth Germany took the lead of the world in color making, including lake making. The use of coal tar in making dyes was energetically exploited, and German manufacturers of dyestuffs carefully explored the uses of these dyestuffs in lake making and covered their uses and potential uses with myriads of patents. Sulfonated azo colors were prepared and the alkali earth salts used successfully as brilliant pigments of high tinctorial strength. The most extensively used of these was lithol red, 2-naphthylamine-1-sulfonic acid diazotized and coupled with b-naphthol. Numerous developments of alizarine lakes and other lakes of anthroquinone and other anthracene dyes were patented. Early in this century the phosphotungstate and phosphomolybdate lakes appeared, marking a great advance in the value of lakes prepared from basic dyestuffs. More recently the phthalocyanine dyestuffs appeared which were adapted for lake formation by sulfonation and by treatment with resinate salts. (Refer to literature index for numerous references on all types of colors mentioned herein).

During the first World War the virtual monopoly which German enterprise held on color production of all kinds was broken by the development of the dyestuff and pigment industries in the United States, and in the years leading up to the recent great war the United States assumed the lead in world dyestuff production. *(531,* pp. 259-260; *527,* p. 157).

With the development of the pigment and color lake industry, a large literature appeared on the subject in the journals and in the form of books. In 1903 there appeared the "Handbuch der Farbenfabrikation" of Geo. Zerr and R. Rübencamp, and in 1908 "A Treatise on Color Manufacture" by the same authors appeared in English translation by Dr. Charles Mayer. This work gives thorough-going directions for setting up a color factory and producing known types of colors. It is of interest to note that in this work 210 pages were devoted to mineral colors, 115 pages to natural mineral colors and only 80 pages to organic colors. (555)

A contemporary French writer remarked: "Assurement, les couleurs artificielles ne peuvent pas lutter advantgeusement contres certains produits naturels, commes les ocres et les terres diverses; par contre, leur vivacite et la beaute de leurs nuances les rendent interessantes pour l' impression ou l'on a besoin de couleurs brilliantes." *(483)* The large scale industrial use of coal tar colors was not envisioned at that time (1907).

Subsequently German texts appeared on pigment making and pigment technology by J. Springer *(545)*, G. Schmid *(541)*, and C. A. Curtis *(526)*, English texts by G. H. Hurst *(533)*, H. Jennison *(542)*, J. G. Bearn *(525)*, Imperial Chemical Industries *(524)* and A. W. C. Harrison *(532)*, French by J. De Salme and L. Pierron *(540)* and American by J. Matiello and collaborators *(536)*. Numerous historical articles, reviews on lake-making and articles on lake manufacture are cited in the index at the end of this work.

A thorough going study of the phenomenon of color in both its physical and psychological aspects was undertaken by Wilhelm Ostwald and reported in his book "Color Science." *(539;* note, also 454). Reviews and discussions on Ostwald's system have been published by Sachs (390) and Scholefield *(406)*.

Little theoretical understanding of the formation of lakes (in the more particular sense of a dye becoming affixed to a substrate) existed until the work of A. Werner on coordination. *(507, 528)* The term mordant was first applied by the French to metallic salts which were supposed to act by biting or opening a passage into the fibers of a cloth, giving access to the dye (mordre = to bite) *(552)*. In Zerr and Rübencamp's text, translated by Mayer in 1908 *(555)*, it is stated that a theory of lake pigments has not yet been clearly enunciated. However, Werner's theory of mordant dyes had already been formulated *(322, 327)* and a vigorous literature on the relationship between mordanting and complex compounds had already sprung up with notable contributions by C. Lieberman *(328)* and later O. Baudisch *(432)*. Much additional understanding was contributed by the experimental works of W. Bancroft *(423, 350, 480, 427)*, H. B. Weiser *(417, 418, 419, 521, 420, 422)* and their co-workers, and the electronic valence studies of N. V. Sidgwick *(543)*.

The Science of Lake Making

There are three major classes of dyes which enter into lake making:

1. Acid Dyes. These contain one or more replaceable hydrogen atoms (ions) by means of which a lake may be formed by metathesis with a metallic compound. The replaceable hydrogen is usually the acidic hydrogen atom of a sulfonic acid or carboxyl group, or the hydrogen of a phenolic OH group. Acid dyes are usually made into lakes by precipitation by a metal (most usually an alkali earth metal), or absorption on a hydrous metallic oxide substrate, or a combination of both of these actions. They are destroyed by acids or alkalis in sufficient strength to reverse the metathesis or to dissolve the substrate.

2. Basic Dyes. These dyes always contain one or more amino group and are precipitated by many organic materials of the protein-precipitating type such as tanin, gallic acid, etc., and by phosphotungstic and similar inorganic acids. Stated otherwise, the basic dyes are precipitated with agents forming insoluble complexes with nitrogen compounds.

3. *Neutral or Quasi Neutral Dyes.* They include the insoluble dyestuffs (e.g., para red) which may be precipitated on inert substrates such as alumina hydrate, blanc fixe, china clay, whiting, etc., or mixtures thereof, and certain specific qualities are imparted by the substrate; also, vat dyes, the soluble leuco bases of which may be oxidized in the presence of a substrate and a lake obtained. Within this group are found insoluble dyes which have acid (such as dark para red) or nitrogen atoms (such as indigo), which, however, play no specific role in the lake formation.

Alumina Hydrate Lakes

Alumina hydrate is commercially the most important substrate for acid dye lakes. The mechanism of the formation of alumina hydrate lakes, particularly of the lakes of alizarin and Congo red has been widely studied. Basic to the understanding of alumina hydrate lakes is the colloid chemistry of the alumina hydrate itself.

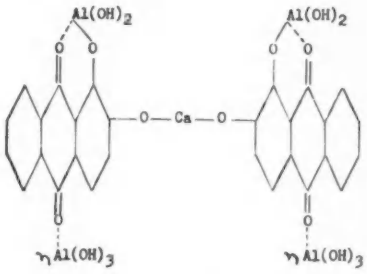
On addition of ammonia to an aluminum salt in hot aqueous solution, a gel γ-$Al_2O_3.H_2O$ is thrown down. *(552)* On aging in the cold, the gel goes to α — $Al_2O_3.H_2O$. On prolonged aging

gradually transforms to $\alpha - Al_2O_3.3H_2O$ and finally $\gamma - Al_2O_3.3H_2O$. The process is more rapid in water containing alkali. Gelatinous alumina may be peptized to a sol with dilute hydrochloric acid or aluminum chloride, or sols of hydrous alumina may be formed from aluminum salts of volatile acids by heating. Conversely, alumina sols may be cogulated by electrolytes; in general the anion with the highest valence precipitates the sol at the lowest concentration. Moreover, the order of efficacy of anions in precipitating the sol is parallel to their order of ability to displace absorbed chloride, which will be seen later to have a significance in lake forming phenomena. Weiser *(552)* visualizes the micelle of hydrous alumina sol as a nucleus containing $XAl_2O_3.(x + y)H_2O.zHCl$, surrounded by an adsorbed layer of H^+ and Al^{+++} ions, which is, in turn, surrounded by an electrostatically held layer of chloride anions. When an electrolyte with a di- or polyvalent anion is introduced, its higher charge causes it to displace the electrically weaker chloride ions and to draw closer to the positive ion layer than does the weakly charged Cl^-. This tends to neutralize the charge on the particle as a whole, thus reducing the forces of repulsion between individual particles and giving rise to the breakdown of the sol and precipitation of a gel.

It is very difficult to rid an alumina hydrate gel of adsorbed salts. An alumina hydrate prepared by A. Voet (428) from $Al_2(SO_4)_3$ and Na_2CO_3 and washed free of soluble sulfate showed by analysis a solid phase containing 0.41 milliequivalents of Na and 1.57 milliequivalents of SO_4 per gm. Al_2O_3. When the alumina was treated with Orange II dye solution, the adsorption of the dye displaced all the Na ion, showing that in this particular case the lake formed by exchange adsorption. Voet's study on Orange II lakes with alumina showed further that two different mechanisms of lake formation were operative. Absorption curves for the dye under different conditions of concentration and pH showed that at pH's above 7.0 all the dye was precipitated by adsorption, verifying Bancroft and Farnham *(427)*, and that at pH's below 5.5 all the dye was precipitated in the form of an aluminum salt, AlX_3, verifying Marker and Gordon *(386A)*. At pH's 5.5-7.0 a mixture of the two types occurred.

The adsorption type of lake may form under a variety of circumstances which illustrate the complexity of the technology of this subject. Congo red, the disodium salt of diphenyl-diazo-bis-naphthalene-4-sulfonic acid, in aqueous solution contains red colloidal ionic micelles (aggregates of simple ions). Replacing the sodium with hydrogen gives a blue, colloidal acid *(420, 552)*. The hydrous oxides of iron, chromium and aluminum form stable lakes with Congo red. On mixing the positively charged hydrous aluminum oxide sol with the negatively charged blue acid sol of Congo, mutual coagulation of the oppositely charged particles occurs and a blue lake forms. However, the alumina sol also adsorbs the negative, red Congo anion, and depending on the hydrogen ion concentration and the total amount of blue acid present in the system, a red, blue or purple (mix of red and blue) lake will be obtained. Essentially the same result is obtained with the hydrous oxides of aluminum, chromium, iron, zirconium and thorium. R. Tanaka *(457)* describes the formation of a Congo sol and the effect of KI, KCl, $Ca(NO_3)_2$, and $CaCl_2$ on the color of the solution and on the precipitate.

The alizarin lakes on alumina hydrate have been extensively studied by numerous investigators. In the famous Turkey Red, alizarin is added to a hydrous alumina hydrate and a calcium salt is used as an auxiliary precipitant. The lake is formed in the presence of sulfonated castor oil (Turkey Red oil) or some suitable substitute and a lake of extraordinary fastness to light and other destructive influences results on boiling the mix. It was observed that the ionic environment in which the alizarin was brought into contact with the alumina hydrate played an important role in the amount of dye absorbed by the hydrous oxide substrate. Sulfate ion, for example, was found to decrease the absorption while calcium increased it. The effect of the ions was considerably influenced by the pH of the medium; at high pH's the OH^- masked the effect of the $SO_4=$ and at low pH the H^+ masked the effect of the Ca^{++}. Studies on the displacement of less strongly adsorbed ions by more strongly adsorbed ions (already referred to in connection with the displacement of chloride anion in the precipitation of alumina sols) showed that the lake formation of alizarin on alumina is entirely similar to the ion adsorption phenomena on alumina. Moreover, the alizarin lake has the red color of the alizarin anion and not the yellowish color of the alizarin acid nor the purplish black color of sodium alizarate. *(552)* Alizarin baths must be slightly alkaline in order for the alizarin to remain in solution, and since the hydroxyl ion is strongly adsorbed and acts to prevent the adsorption of other anions, calcium ion is introduced into the system and, as a strongly adsorbed cation, counteracts the anion-repelling qualities given to the hydrate by the OH^- and makes possible the adsorption of the alizarate anion. The cation associated with the alizarin may be Na, NH_4, K, H or Ca without materially modifying the color excepting insofar as its adsorption affects the adsorption of the alizarin ion. Krasnovskii claims that on boiling the madder lake a compound of the following type is developed. *(466)*.



He claims that he obtained a light-fast lake with n = 1. He says further that the color tones of madder lakes do not depend on the chemical composition but on the dispersion and probably also the water of hydration.

R. Haller *(383)* says that the Ca, Al salt is dispersed in the polymerized fat acids produced from the Turkey Red oil. He bases this view on observations of inhomogeneities in the dye deposition on the fabric when viewed in dark field illumination under the microscope.

Bancroft and Farnham undertook phase rule studies on differently prepared samples of alumina treated with alizarinic acid and found that while freshly precipitated and washed alumina showed good absorption of the dye, alumina prepared by hot hydrolysis, and dried ppted. alumina showed diminished effectiveness and calcined alumina was inert toward the alizarinic acid. *(427)* When alumina hydrate is formed from an aluminum salt, the adsorbed ions have the effect of arresting the aging process whereby the power of the alumina hydrate so absorb (or adsorb) dyes becomes diminished. *(552)*

Aluminum-alizarin lake can be peptized with an excess of sodium alizarate and the sol may be used directly for dyeing, having the advantages of a dye solution carrying its own mordant. *(424, 552)*

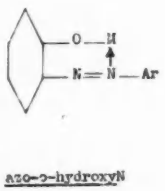
Gallium-calcium alizarin lakes have been prepared and studied. *(388)* Tin and zinc lakes of alizarin are different than the aluminum lakes in that the hydrous oxides of tin and zinc do not adsorb the red alizarate ion but the yellow acid and the purple sodium salt, giving lakes that vary from yellow to purple, depending on the pH. *(427, 552)* Fe^{++} does not form an alizarin lake. *(460)* Dyes have long been classed as monogenetic or polygenetic according to whether they will give one or several shades according to the conditions of mordanting. Bancroft

points out that the different colors of polygenetic dyes on different colorless mordants are conditioned on whether the mordant acts as an ionizing or non-ionizing adsorbent. *(350)*

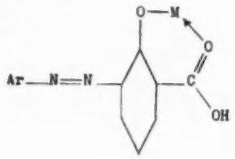
Muromtsev and Ivanova describe methods of preparing alizarin pink lakes on alumina-aluminum phosphate substrates. *(336)* Viktorov studied the effect of various ions and agents on alizarin lakes and found both advantageous and deleterious effects could be produced. *(460, 448)* Many substituted derivatives of alizarin have been prepared and the lake-making properties studied, numerous references to which may be found below in the literature index under alizarin and anthraquinone.

Sidgwick *(543)* shows that mordant dyes function as such because of their capacity to form coordinate linkages with other substances and, in particular, to form chelate rings. He points out that of some 160 mordant dyes listed in Schultz's "Farbentallen" in 1914, all but about a half dozen contained replaceable hydrogen atoms and a donor atom so disposed that they could form a ring of either five or six atoms. The mordanted compounds are of the types:

anthraquinone



azo-o-hydroxyN



azo-salicylic acid

The "bite" of the mordant is accomplished, therefore, by chelation. A study by Beech and Drew showed that Al does not form lakes with o-mono-hydroxy-azo dyes as do some other metals, but Al forms well defined lakes with o-o'-di-hydroxy-azo dyes. Even in this case the lakes do not form as readily as the Cr lakes. Acid plays a decisive role in such lake formation. *(399)* Lieberman reported (in 1902) that the oxides of Y, Be, Th, Ce, Zr and Cu hold dyes most tenaceously; the oxides of Zn, Cd, Mn, Sb, Bi, Pb, Sn and Ti are much less satisfactory, and the oxides of Fe, Al, Cr and V occupy an intermediate position. Other investigators found conflicting results on the relative strengths of Al and Zr as mordants. *(552)* Titania has been reported to be a particularly good mordant for leather. *(445)*

Great numbers of dyes have been used for lake formation on alumina hydrate, and all such lakes are essentially analogous to one or more of the types described above. The lake is either a salt formation (as with Orange II in acid solution) or the adsorption of an ion (as in madder lake), a dye acid (as Congo blue lake) or a metallic salt of the dye (as the adsorption of Na alizarinate by hydrous tin oxide, etc.). Standing outside of this generalization are those loosely defined lakes which are simply insoluble coloring matters intimately associated with a substrate by precipitation with it or on it, or intimately mixed with it. While not true lakes in the more restricted sense of the term, there is nonetheless a definite effect, in such a composite, attributable to the substrate. Ostwald has described lakes composed of various whites used as diluents for metallic salts of dyes to which be applied the name "filled dyes." *(455)*

Color lakes are frequently formed on a coprecipitated alumina-hydrate-barium sulfate. A 1:3 coprecipitated mixture is known as gloss white *(536)*. It has been used extensively in surface-coating pulp colors and in printing ink colors. A coprecipitated calcium sulfate-alumina hydrate is used extensively in surface coating for papers under the name "satin white." Sutermeister *(476)* says satin white is $3CaO.Al_2O_3.3CaSO_4.3IH_2O$. O. B. Beyer says it is a complex sulfo-aluminate. *(368)*

Alumina hydrate lakes serve as analytical tests for aluminum ("aluminon" lakes, *391; 421)*. Metallic lakes have been used in bacterial stains *(486)* and a variety of uses other than as paint and ink colors. Titania hydrate, zirconia hydrate and other hydrous oxides have been used in lake-making, but in pigment technology the use of alumina far exceeds all the others. The following is a list of alumina hydrate lakes in common use as pigments; *(527, 531, 536)*

Reds:
- Amaranth (azo bordeaux)
- Pigment scarlet
- Ponceaux scarlets
- Madder lake

Orange:
- Persian Orange (Orange II)

Yellow:
- Chinoline Yellow
- Tartrazine yellow

Green:
- Acid green

Blue:
- Acid Peacock Blue (Erioglaucine)

Purple-Violet:

None in extensive use

Lakes From Basic Dyes

This group comprises pigments from the triphenylmethane, ketonimine, basic xanthene and thiazole dyes. The pigments are prepared from aqueous solutions of the dyes by precipitation with: *(536)*

1. Tartar emetic and tannic acid
2. Phosphotungstic or phosphomolybdic acid
3. Aluminum sulfate and sodium silicate
4. Aluminum sulfate and sodium benzoate or sodium salicylate
5. Green earth or china clay (by adsorption)
6. Precipitation with acid dyes or other organic acid materials

Tannic acid or tannin is a term long applied to a large class of substances found in many plants and distinguished by their astringent taste, blue-black or green coloration with ferric salts, precipitation by a solution of gelatin, albumin or alkaloid, and the ability to unite with hide to form leather. *(551)* It was formerly believed that only one tannin existed but it is now known that tannin from different sources differs in composition and properties. Tannic acid readily combines with basic coloring matters to form lakes, precipitating insoluble tannates. *(548)* It is rarely used alone, since the resulting lakes are dull and fugitive, but the addition of tartar emetic causes complete fixation of the lake and improves the fastness to light, spirits, etc., and gives more brilliant shades. A. Sanin *(453)* says the lakes are stable only when the tannin is not in excess. If excess tannin is present an adsorption composition results. The fabric plus the tannin solution plus the tartar emetic gives a compound $(C_{14}H_9O_9)_2SbOH$ which combines with a basic dye through the OH group. (Tannic acid has been ascribed the formula $C_{14}H_{10}O_9$ *(531))* If NaCl is added to the tartar emetic solution, a salt $(C_{14}H_9)(SbO)O_9$ forms which does not take up the basic dye. Other organic acids have been investigated as substitutes for tannin, such as tamol, katanol, etc. *(493)* Napthalene sulfonic acids have also been used as precipitants for basic dyes *(225)*. Tannin and organic acids in general give lakes which are apt to bleed in alkali, soap, water or alcohol and fade rapidly on exposure to light. *(527)*

Bancroft and Ackerman made a study of the mechanism of the formation of the so-called aluminum benzoate lakes. They formed the lakes by adding to a solution of the dye (methyl violet) HAc, $Al_2(SO_4)_3$ and $NaCO_2.C_6H_5$. According to their findings the benzoate adsorbs the dye and the alumina adsorbs the benzoate. The $Al_2(SO_4)_3$ "forces" the dye on the mordant. The adsorption of the benzoate increases

with temperature up to 90° and then decreases. The lakes become stronger on standing several days. Alumina was found to be the best mordant for methyl violet; Cr_2O_3 is good for darker shades. The use of aluminum and other salts with residual "natural acid function" to precipitate dyes is described in a French patent taken out by R. P. Lance. *(240)* A method of precipitation on $Zn_2Fe(CN)_6$ is described by E. Justin-Mueller. *(484)*

The lakes formed by adsorption of basic dyes by green earth or the earth substrates is of negligible importance. (See *365*) The use of organic acids and acid dyestuffs have also played a negligible role as precipitants for the basic dyes.

The development of the phosphotungstate and phosphomolybdate lakes of basic dyes largely eliminated the objections to the earlier tannin lakes and produced pigments of good fastness to light and organic liquids. Brilliant shades of high tinctorial strength are produced with these precipitants. However, the susceptibility to decomposition by light and alkali was by no means entirely eliminated.

The phosphotungstic and phosphomolybdic acids used in lake manufacture are individuals from among a wide variety of compounds containing the groups Mo_2O_7 or W_2O_7. Among the important compounds of this type are: *(528)*

$R_{10}(H_2(W_2O_7)_6)$
$R_{10}(H_2(Mo_2O_7)_6)$
$R_4(Si(W_2O_7)_6)$
$R_4(Si(Mo_2O_7)_6)$
$R_7(P(W_2O_7)_6)$
$R_7(P(Mo_2O_7)_6)$
$R_4(Sn(Mo_2O_7)_6)$
$R_4(Ce(Mo_2O_7)_6)$
$R_7(As(W_2O_7)_6)$
$R_7(As(Mo_2O_7)_6)$
$R_4(Zr(Mo_2O_7)_6)$
$R_4(Ti(Mo_2O_7)_6)$
$R_9(B(W_2O_7)_6)$
$R_4(Th(W_2O_7)_6)$

These are typical compounds of the type that Werner studied in development of his coordination theory and the specific application of Werner's theory to these compounds was developed by Miolati and Rosenheim. *(528)* The well known ammonium phosphomolybdate was originally given the formula $(NH_4)_3PO_4 \cdot 12MoO_3$ but Miolatti's determinations of conductivity show the parent acid to be not tribasic but at least septabasic, and he ascribed the formula $H_7(P(Mo_2O)_7)_6$. X-ray analysis has shown the 12-heteropolyacids to be of the form $H_3(PO_4(W_{12}O_{36})).5H_2O$. Thus, numerous formulas have been proposed for these complexes. *(451)*

While the chemistry of the heteropolyacids is complex, their preparation is simple and consists in simply mixing the components in acid or neutral solution. *(528)* The heteropolyacids are readily decomposed by alkalis, forming alkali molybdate, etc., hence the limitations on the lakes prepared from them in alkaline environments. The lakes are formed by simply adding the heteropolyacid to the basic dye solution with enough total acidity present to prevent alkaline decomposition of the product. *(536)* Allen has proposed a structural formula for the lake based on the principle of coordination valencies; this formula is shown in Mattiello's text. *(536)* It is based on the assumption that one basic group in each molecule of dyestuff neutralizes one acid hydrogen of the heteropolyacid, and that all of the hydrogens of the acid are thus neutralized. This formula, like all formulas for heteropolyacids and their compounds is only tentative, based on evidence at hand.

Mattiello *(ibid.)* says that in making the phosphotungsticmolybdic lakes, *strength or tinctorial power* is favored by increasing proportions of molybdate, decreased acid and by decreased amount of precipitating agent. *Texture* is improved by decreased proportion of molybdate, increased acidity and increased amounts of precipitating agent. *High yield* is favored by increased proportions of tungstate, increased acidity and increased amounts of precipitating agent.

Reduced colors may be prepared by preparing the full-strength color (toner) and adding such bases as blanc fixe, gloss white clay, etc.

The phosphotungstic and phosphomolybdic acids are very sensitive to reduction; they yield, on moderate reduction, highly colored compounds which resemble the corresponding unreduced compounds in all respects except for color. Ferrous salts, sulfite, uric acid and other mild reducing agents may be used. The reduced complex acids may be restored by oxidation with bromine water or other oxidizing agents. The reduced acids may be used as such to precipitate the dyes and form lakes. Many patents have been filed, giving formulas for producing improved heteropolyacid lakes where the use of the acids in the reduced form was specified *(55,* etc.). The reduced complex may also be reacted with organic bases which are not dyes, such as p-amino-benzaldehyde to give pigments. *(55)*

Conversely, the leuco compounds of dyes may be precipitated with the heteropolyacids and oxidized back to the dyestuff either simultaneously with or subsequent to precipitation. Patented processes claim advantages for this method. *(52, 164, 234, 291)* By precipitating *sulfonated* basic dyes with heteropolyacids, lakes have been prepared with characteristics of acid dye and basic dye lakes. *(35, 42, 277)*

Linz and Coffer published comprehensive reports on the precipitation of ten different basic dyes on various phosphotungstic and molybdic mixtures, giving extensive tabulation of data on properties of the pigments they prepared. *(323)* Neergaard investigated the cause for the superior light-fastness of basic dye lakes precipitated with the heteropolyacids. *(452)* He found that up to a certain maximum the light-fastness increased in a manner proportional to the amount of acid absorbed in the lake in excess of that required for actual salt formation. The adsorbed acid is present only at the surface of the lake, hence the fastness is proportional to the surface concentration of the precipitating acid on the lake particles. Neergaard claims that the bleaching by light is an oxidizing action and the fastness of the lakes is due to the retarding action of the acid precipitated on top of the lake. He offers a reaction mechanism for the photochemical oxidation of the dyes. In a later paper *(388)* Neergaard presents equations representing the photochemical reaction in terms of dye, precipitated acid, dye decomposition product and reduced acid.

A number of investigators found that heating the lake after its formation to the boil, or under pressure to higher than the normal boiling point gave faster colors. *(60, 166, 296,* etc.). The only change noticed during heating the slurry is a slight alteration in the rate of settling or a change in the flocculation of the precipitate; *(536)* hence, it is probable that the increase in the fastness is not associated with a profound change in structure, such as proposed by Krasnovskii for madder lake *(vide supra).* Patents have also been taken out on partially neutralizing the heteropolyacids before the precipitation, which the patentees claim gives stronger and faster colors. *(57, 284)* Some processes attempt to use complexes of tannic and gallic acids along with the inorganic acids *(174);* in others, organic amines which are not dyes are coprecipitated with the dyes. *(54)* Some of the patents embrace the use of silicon, titanium and antimony tungstate heteropolyacids. *(126, 270, 317)* The more commonly found modern lakes of the phosphotungsticmolybdic type are:

Red:
Rhodamine
Magenta (Fuchia, pararosaniline)

Yellow:
Auramin
Thioflavin

Green:
Malachite Green
Brilliant Green

Blue:
Victoria Blue

Setoglaucine

Violet:

Methyl violet

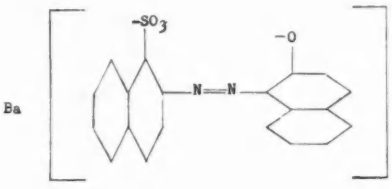
Metallic Salts of Sulfonic Acids

Virtually any dyestuff may be sulfonated, thus introducing the possibility of salt formation and obtaining some of the advantages of inorganic compounds, such as insolubility in organic vehicles, non-subliming, etc. Extensive literature appears on this subject, particularly patent literature. In many cases the development of sulfonated dye derivatives was apparently motivated primarily to give the patentee a monopoly on all possible developments on a specific type of dye, without regard to the immediate practicality of using the sulfonic acid derivative. Considerable work has been done on the development of sulfonic derivatives of anthraquinone dyestuffs without any extensive application thereof ever being made to practical pigment manufacture. Reference has already been made to the lake-forming sulfonic acid dyestuffs which form adsorption type lakes on metallic oxide hydrosols and hydrogels (such as Congo red). In this section we shall consider only those sulfonic derivatives the pigment value of which depends specifically and particularly on the formation of insoluble salts with metals. All the commonly used lakes of this type are made from azo dyestuffs.

Sulfonated azo dyes may be made either from a sulfonated amine *(1, 3,* etc.) which is diazotized and coupled with β-naphthol or a derivative (lithols and lithol rubines are examples); or aniline or a naphthylamine (or derivatives) may be diazotized and coupled with a sulfonated phenol or naphthol *(1, 99,* etc.). This latter method usually leads to soluble dyestuffs applicable to the formation of lakes on hydrous oxides and not generally suitable to formation of insoluble salts usable as such for pigment purposes.

In coupling a diazonium salt with an intermediate containing OH or NH_2 in a 2 position, the combination takes place in the 1 position. If this position is occupied, no formation of the azo compound occurs. *(536)* If the diazonium salt is coupled with a 1-naphthol or 1-naphthylamine, combination takes place in the 4 position. If this is occupied, or if the positions 3 or 5 are occupied by a sulfonic acid group, combination takes place in position 2.

The most widely used of the insoluble metal sulfonates of azo dyestuffs is lithol red, 1-sulfonaphthylene-azo-2-naphthol. The Na salt of this dye is nearly insoluble and is used directly as a pigment of light red or orange hue. *(536)* The Ba and Ca salts give successively deeper and bluer shades. Those salts are thought to be of the form:

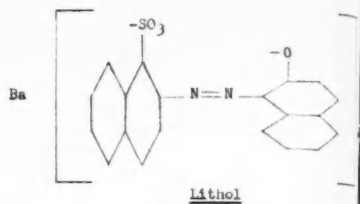


and the metal thus replaces a hydrogen from each of the groups SO_3H and OH. The dye thus behaves as a dibasic acid. In practice the lithol usually contains a small amount of the 6-sulfo isomer of the amine. (1-sulfo-2-naphthylamine is known as Tobias acid and 6-sulfo-2-naphthylamine as Brönner's acid).

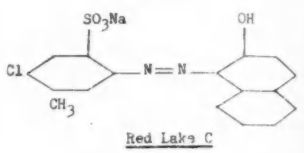
The conversion of the sodium salt to a heavy metal salt does not take place at ordinary temperatures, but on heating a point is reached (60°-80°) at which a sudden change occurs and the heavy metal salt forms. Processes have been described for forming lakes from azo dyes without intermediate formation of the Na salt by having other precipitants and agents present, *(206)* or coupling the diazonium salt after forming the metallate of the intermediate. *(9, 154)* One patent on a sulfonated azo pigment claims that a mixed Na and Ba precipitate of the dyestuff is superior in quality to a physical mixture of the separately formed Na and Ba salts. *(852)* Important pigments are obtained by co-precipitation or subsequent precipitation of the metal resinate (colophony or other resin) with the azo dye salt.

While the metal salt of the dye is usually formed by heating the Na salt of the dye with the desired alkali earth salt, processes have been patented for forming lakes by grinding the dry azo dye with a substrate and a small amount of a concentrated solution of the metal salt. (See literature index under "Grinding, reaction by dry"). Another technique for forming the metallic salts of the azo dye is by treating the dye with alkali or ammonium bisulfite, forming a soluble complex. This is then treated with the metal salt and a hydroxide to precipitate the dye. If the mechanism of the reaction is the same as shown in Fieser and Fieser *(529)* for the addition of alkali bisulfite to azo-methane dyes, then it is a simple saturation of the double bond between the nitrogens with H going to one nitrogen and $NaSO_3$ to the other.

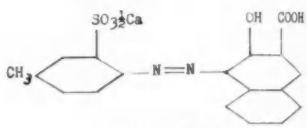
While numerous azo couplings have been applied to the lake-making art (see index under aniline, naphthylamine, etc.), only a few types have met with wide and lasting acceptance. The principle types of metallic azo-sulfonates are: *(536)*



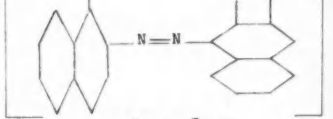
Lithol



Red Lake C



Lithol Rubine



Maroon Toner

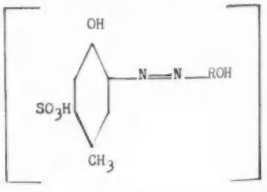
Red Lake D

The Red Lake D has been included here in view of the essentially analogous part played by the carboxylic acid group to the sulfonic acid group in the Red Lake C, etc.

Soluble Metal Dye Compounds

While these compounds play no role in the pigment trade, they play some role in dyeing and a considerable role in the general chemistry of metal organic compounds.

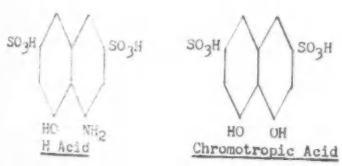
Sidgwick *(543)* states that all azo compounds with a hydroxyl group adjacent to the diazo link are mordant dyes. This is due to the facility with which such a structure forms a five membered chelate ring with a metallic atom. Some of the metallic compounds so formed are soluble. A simple metallic dye of this type, patented by Crossley and Shafer is described in the patent as



where M may be Cr, Cu, Fe, Al, Mn, Co, Ni, V, Ti, Zr, or combinations of these. The products are said to be water soluble dyes which dye animal fibers blue, red and brown. *(71)* The metallic derivative is formed by prolonged boiling of the unmetallized dyestuff in a salt solution of the metal. In an article on "Soluble Metallic Derivatives of Dyes," Boyle *(384)* says that in the formation of soluble Cr derivatives two stages are noted. The "primary chromium compounds" are soluble but sensitive to acids, while the "secondary chromium compounds" resulting from continued treatment are less sensitive to acid and light, but are better and brighter.

Insoluble Metal Dye Compounds

Closely related to the soluble compounds mentioned above are the insoluble metal dye compounds. Aside from the type of lake described in connection with alumina hydrate above, a type of mordant lake is in use in which a fiber or dye or both are boiled with sodium dichromate. Independent from the actual formation of the lake on the chromium hydroxide (resulting from the reduction of the bichromate), the dye itself is either deepened in color or the color may change completely. The process is called "chroming" and the dyestuffs so treated are called chrome dyes. The majority of dyes that are chromed on the fiber are made from chromotropic acid, made by treating H-acid with sodium hydroxide: *(529)*

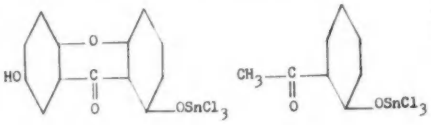


According to Karrer's "Organic Chemistry" *(535)*, the dye is partially oxidized during the chroming process and the $Cr(OH)_3$ forms a lake with the oxidized dye. The lakes formed by this process are usually brown or black shades (Diamond Black F, Diamond Black PV, Chromotrope 2R, Victoria violet 435, Metachrome Brown B *(529)*). Studies of the structure of chrome dyes have been made by Rosenhauer, Wirth and Röniger *(334)*, and of chromium compounds of dyes by Pfeiffer & Säure *(335)*, and Drew and Fairnbairn. *(398)*

Other insoluble metal dye compounds are the iron compounds with nitro and nitroso phenols and other hydroxylated compounds, and the phloxines *(536, 344)*, which are lead salts of fluorescein derivatives. A brown pigment can be prepared by coupling para red (p-nitrobenzene-azo-b-naphthol) in the presence of copper salts *(272A;* see also *397)*.

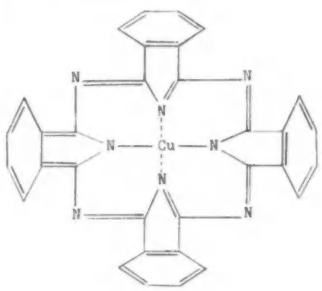
Beech and Drew say that both nitrogens of an azo dye can become coordinated to metal atoms and the aromatic nuclei can revolve to either side of the azo chain. The dyes can adjust their configuration so the structural requirements of substituents in the nuclei and the valency of the lake forming metal. *(400)*

A group of metallic compounds of particular theoretical interest is obtained by boiling $SnCl_4$ with aryl hydroxy ketones in benzene solution. Colored metallic derivatives of the type:



are obtained. Chelation occurs between the Sn and the keto oxygen in o-hydroxy ketone derivatives, but in *m-* and *p-*compounds, only addition products are obtained. *(325, 329)* These compounds are decomposed by water.

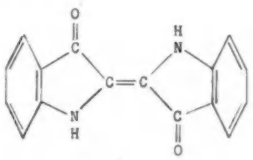
While in the metal compounds just described the metal is introduced into the perimeter of the molecule, another type of metal dye compound in which the metal is at the center of the molecule has been introduced in recent years. The so-called phthalocyanines first made their appearance on the market in 1935, having been announced two years previously by R. P. Linstead and his associates. *(536)* The original patent (Brit. *322, 169)* called for its preparation by the action of ammonia on phthalic anhydride, phthalamide or phthalimide in the presence of metals. The structure was later derived to be:



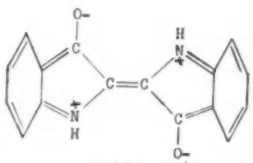
Aside from the Cu derivative, a metal free derivative and Ni, Mg, Pb, Sn^{++}, Na and other derivatives have been prepared. The copper derivative has found the widest use as a pigment up to the present time. Its great value lies in its extreme resistance to light, heat, solvents, oxidizing and reducing agents, acids and alkalies. It is spectrally of very pure shade and extraordinarily high tinting strength. Derivatives such as the chloro and sulfonic acid derivatives have been prepared. The latter are soluble and can be used in dyeing and lake making. *(536,* and see index)

Insoluble Dyestuffs in Lake-Making

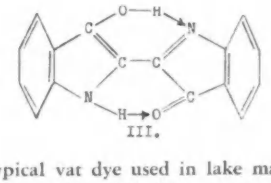
Insoluble dyes, such as insoluble azo dyes or vat dyes may be used in making lakes by adding substrates or extenders to the dyestuff either after it has been struck or to the intermediates from which it is prepared. Para red and other insoluble non-metallic azo dyestuffs are thus used to make lakes. *(6, 491)* Large numbers of insoluble dyestuffs have been patented for making color lakes. (refer to literature index)



I.



II.



III.

A typical vat dye used in lake making is indigo. *(529, 536)* The conventional formula for indigo is I, but the failure of this formula to explain the X-ray evidence that indigo is a trans-configuration and the cis form has never been obtained led Kuhn to propose II as the structure. This formula explains the trans orientation by the mutual attraction of the oppositely charged oxygen and nitrogen atoms for one another. The longer conjugated system also accounts for the intense shade of the dye. The chelate formula III would explain the stability of the compound as well as the preferential formation of the trans form. Indigo is red in the vapor phase and in non-polar solvents, where it shows half the molecular weight evidenced in polar solvents (in which the color is blue). Kuhn suggests that the aggregates present in the blue solutions of indigo contain one molecule overlaid upon another in such an orientation that the four charges of the first molecule are attracted by the opposite charges of the second. The leuco product of indigo (obtainable by fermentation in the early process and by reduction with sodium

hydrosulfite in the modern process) is soluble in alkali and is oxidized by air to the insoluble dye.

Vat dyes are all quinonoid substances that are readily reduced to hydroquinonoid compounds reoxidizable by air.

The use of indigo in lake making is very limited. De Navarre *(538)* lists Indigo blues among the cosmetic colors, and Mattiello *(536)* says they are coming into more use because of their permanence and durability. Kinsman expressed the opinion *(405)* that the scarcity of fast to light lake colors was due to the failure to exploit vat colors for this purpose. Various colors other than blue have been prepared from indigo by forming derivatives, such as Indigo Yellow 3G, thioindigo or Helindon Red 2B, etc. *(529)*

Other Types of Lakes

The literature describes a large number of miscellaneous precipitants for dyestuffs such as nitrogenous by-products, various resins and resinous condensation products, sulfurized phenols, etc. Such lakes have only limited application and in some cases were introduced merely to find an outlet for some otherwise useless by-product material.

Substrates Used in Lake Making

While hydrated aluminum oxide is the chief adsorption substrate used in commercial lake making, the hydrous oxides of many other elements have been used either on a limited commercial scale or in academic studies. Be, Cr, Cu, Ga, Fe, Mg, Si, Sn, Ti, Zn and Zr are conspicuous examples. Many fundamental studies on the precipitation and properties of these hydroxides were of value in throwing light on the phenomena of lake formation. *(332, 396, 552,* etc.) A Canadian patent describes the total absorption of organic matter by a titania hydrate *(309;* See also *310).* (See index on Ti and Zr hydroxides and dye compounds).

Alumina hydrate as a substrate *(536)* is transparent, bulky and has a high oil absorption. It is reactive in contact with fatty acids and causes the phenomenon of livering, an apparent gelling of the vehicle. *Barytes*, natural occurring $BaSO_4$, is a very heavy white extender pigment of low covering power, very low oil absorption, and good chemical stability. It finds wide use in paints and enamels. *Blanc fixe*, the synthetic $BaSO_4$, is similar to barytes but has a finer texture and much higher oil absorption. $CaCO_3$ in the form of natural chalk or a precipitated product is known as whiting; it finds wide use in paints using water vehicles, in which it shows a high covering power. *China clay*, a hydrated aluminum silicate, has a very fine and soft texture and finds wide use in paints where high consistency and low-pigment solids are required. *Green earth*, a hydrous Fe, Mg, Al, K silicate, has been recommended for use in light-fast and lime- fast lake pigments. *(20, 364, 365, 536)* The composite white substrate pigments, *gloss white* and *satin white*, have already been touched on in connection with alumina hydrate lakes, above. The coprecipitated gloss white is said to be superior to the mechanical mixture because of better working properties and less tendency to adsorb drier from the ink on standing. Other extenders which are mixed with lakes in formulating paints, inks and cosmetics but are generally not used directly in the preparation of the lake, are asbestine, barium carbonate, calcium magnesium carbonate, diatomaceous earth, gypsum, magnesium carbonate, magnesium silicate, mica, talc and silk white (a calcium silicate). *(475, 536)* Gardner has recommended the use of Pb and Ti phthalates because of their beneficial strengthening effect on paint films and their protective action due to their effectiveness in shutting out ultraviolet light.

Color-Lake Technology

Extensive references are given in the literature index below to books, review articles and historical articles on color-lake technology. Color lakes must be prepared under carefully controlled conditions of temperature, amounts and concentrations of reagents, pH, processing time, mixing rates and methods, chemical environment and physical handling. (See *410)* Numerous devices of both chemical and physical nature have been devised to produce specific effects (use of dispersing and wetting agents, specific ions, oxidizing and reducing effects, atomizing with compressed air, etc., etc.). In no field have a richer variety of techniques been applied. The evaluation of pigments is a whole science in itself *(530)*, and has been responsible for much of the incentive to improve the quality of color lakes and pigments in general. The question of light-fastness of lakes has attracted particular interest. The work of Neergaard on the fastness of phosphotungstic molybdic lakes has already been discussed. In 1912 Srivastava *(444)* reported on improving the fastness of tannin lakes; the development of the phosphotungstic molybdic lakes was not only in itself an answer to the demand for faster lakes than were obtained with tannin, but the further improvements on these new lakes was largely in the direction of refining the process to improve light-fastness. In 1929 Kinsman made note of the superior fastness of dyes on fiber as compared to lakes. *(405)* Clayton claimed that high molecular weight lakes have the advantage in fastness. *(449)* In an article on "Fastness to Light," Stern suggested a system for rating lakes and dyes for fastness. In America and in other countries commissions and other agencies were already engaged in developing standardization systems for colors. *(488, 530)* In an article published in 1931 based on an experimental study Kuhn *(374)* stated that the "basic nature of oxy and hydroxy pigments is responsible for their fading." He said there is no relationship between the fading of pigments and their oil solubility and that an earlier theory that the light fastness of lakes is proportional to the atomic weight of the metal could not be confirmed. A study by Ackerman, reported in 1932, showed that methyl violet, methylene blue, acid green and alkali blue faded in the absence of oxygen. He reported that tannin lakes darken rather than fade, also that certain lakes of Cu, Cr and Fe are faster than the corresponding lakes of Al, Sn and Zn. The fastness of Al, Sn and Zn lakes varies inversely with the degree of saturation of the mordant with the dye. Ackerman and Bancroft *(480)* found that when a colorless mordant acts solely as an adsorbent agent, the mordant increases the fastness to light of the dye, and with equal weights of dye on different colorless mordants, the dye on the less saturated mordant will be faster to light. If the relative adsorbent powers of two mordants are reversed, the fastness to light of the dyed mordants (lakes) will be reversed. If the mordant or salt adsorbs one or more of the decomposition products (of the action of the light) very strongly, the lake may be less fast to light than the pure dye. If the mordant acts as an oxidation catalyst, the dye may be less fast on that mordant than when pure. (Alizarin lakes show exception to the rule relating strength of adsorption to fastness).

Comments

Synthetic chemistry has raised lake-making from an ancient and limited art to a modern technology of almost limitless ramifications. However, the relationship of chemistry to lake making has been reciprocal and lake phenomena have thrown considerable light on matters of theoretical chemistry. Particularly in the field of valency, the formation of metallic dye compounds has offered material for the study of coordination and residual affinity. *(394, 395, 543)* While the technology of lake making has been advanced enormously in the past fifty years, many achievements remain for the future

in pushing back still further the boundaries which mark the limitations of present day pigments in fastness to light, weathering, alkali and other destructive agents, and in brightness, covering, softness, strength and other desirable pigment properties.

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Nos. in Parentheses are Chemical Abstracts References.

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492A. *3*, 267

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Proceedings of the

American Association of Textile Chemists and Colorists

NOVEMBER 18, 1946

Silver Jubilee Convention A. A. T. C. C. 1921-1946

Under the Auspices of the

Northern New England Section

December 12, 13, 14

Hotel Statler

Boston, Massachusetts

Technical Program
Silver Jubilee Convention

Boston, Mass., December 12-14, 1946

Thursday, December 12th

12:30 p.m.-5:30 p.m. — Meeting of the Research Sub-committees.

Friday, December 13th

Fundamental Research Session

9:30 a.m.-10:10 a.m.—"New Developments in the Chemical Modification of Wool." Dr. Milton Harris, Director, Milton Harris Associates, Washington, D. C.

10:20 a.m.-11:00 a.m.—"Some Aspects of the Biological Degradation of Cotton Textiles." Dr. Ralph G. H. Siu, Director, Biological Laboratories, Philadelphia Quartermaster Depot, Philadelphia, Pa.

11:10 a.m.-11:50 a.m.—"Some Principles of the Structure of Synthetic Fibers." Dr. Herman Mark, Director, Institute of Polymer Research at the Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

Applied Research Session

2:30 p.m.-3:10 p.m.—"Theory and Practice in Wool Dyeing." Mr. F. L. Goodall, Research Staff, Geigy Color Company, Ltd., Bradford, England.

3:20 p.m.-4:00 p.m.—"Factors Affecting the Use of Cotton in Plastic Laminates." Dr. Simon Williams, Associate Director, Fabric Research Laboratories, Inc., Boston, Mass.

4:10 p.m.-4:50 p.m.—"Fundamental Principles Applied to the Elimination of Fire Hazards of Fabrics." Dr. Sidney Coppick, Research Laboratories, American Viscose Corporation, Marcus Hook, Pa.

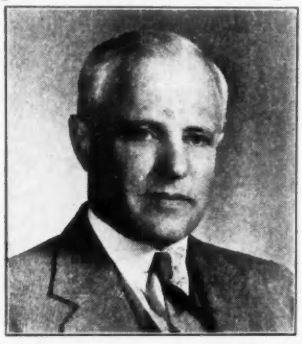
8:00 p.m.-10:00 p.m.—INTERSECTIONAL CONTEST.

Saturday, December 14th

9:30 a.m.-12:00 a.m.—Research Committee Meeting.

2:00 p.m.-4:30 p.m.—Inspection Trip to the Research Laboratories at the Massachusetts Institute of Technology, Cambridge, Mass.

Compton to be Principal Speaker at Annual Banquet



Dr. Karl T. Compton, President of the Massachusetts Institute of Technology, who will be the principal speaker at the Annual Banquet of the Silver Jubilee Convention at the Hotel Statler, Boston, on Saturday evening, December 14th.

Silver Jubilee Convention

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December 12-14

Hotel Statler

Boston, Mass.

ALUMNI GROUP LUNCHEON PLANNED FOR SILVER JUBILEE CONVENTION

ONE of the features of the Annual Meeting to which many will look forward is the Alumni Group Luncheon planned for Saturday noon, December 14, 1946. This informal meeting will be held at the Statler Hotel, the headquarters for the Silver Jubilee Convention. Reservation cards will be sent with the notice of the Convention. It is planned to have leaders from the various textile schools in attendance.

Ralph E. Hale, an alumnus of the Lowell Textile Institute, is Chairman of the Committee and is being assisted by the following alumni:

Ernest R. Kaswell, Massachusetts Institute of Technology; Harold C. Wood, Philadelphia Textile Institute; Richard O. Barry, New Bedford Textile School; William M. Thornton, Rhode Island School of Design; T. Arthur McCann, Bradford Durfee Textile School; and Fred R. Tripp, North Carolina State College.

Any other groups or those seeking further details should contact Ralph E. Hale, The Bell Company, Worcester 5, Massachusetts.

Personnel Service

For the purpose of introducing members to prospective employers the Personnel Service will operate, without charge, from Thursday afternoon through Saturday morning at the Silver Jubilee Convention. Those seeking employment should if possible register before the meeting but employers at the meeting, as indicated below. Facilities will be offered employers for arranging interviews with representatives of educational institutions who register at the meeting.

Every candidate for employment should register in advance on two sets of blanks obtainable from the Secretary, P.O. Box 28, Lowell, Mass. Two photographs, approximately 2 x 2½ inches will be necessary for attachment to the blanks. Late registrations, at the Convention, will be accepted so far as facilities permit.

Employers, registering with the Service at the beginning of the Convention, may consult these qualification records and arrange for appointments. Interviews will be arranged between 2 P.M. and 5 P.M. on Thursday, December 12th; between 9 A.M. and noon, and 2 P.M. and 5 P.M. on Friday; and between 9 A.M. and noon on Saturday.

Further information can be obtained from the Secretary, or at the general registration desk in the Hotel Statler at the Convention.

Executive Committee

WALTER J. HAMBURGER
Fabric Research Labs., Inc.
Technical Program Chairman

GEORGE O. LINBERG
E. I. duPont de Nemours & Co., Inc.
General Chairman

PHILIP S. DURFEE
W. C. Durfee Company
Finance Chairman

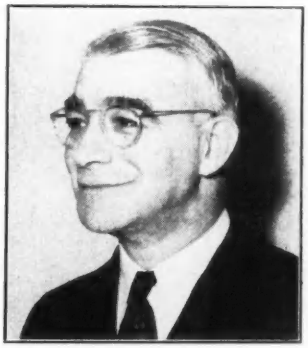
EDWARD S. CHAPIN
W. C. Durfee Company
Reception Chairman

HARRY M. HARTNETT
General Dyestuff Corp.
Hotel Chairman

JOSEPH A. BRYANT, JR.
Bryant Chemical Corp.
Dining Chairman

DELBERT E. RAY
Mass. Mohair Plush Co.
Exhibits Chairman

AZEL W. MACK
Dexter Chemical Corp.
Printing, Registration and Personnel Chairman



HYMAN P. SELYA
Sagamore Color & Chemical Co.
Publicity Chairman

Silver Jubilee Convention

Fall Meeting, Piedmont Section

THE Fall Meeting of the Piedmont Section was held in Charlotte, N. C. at the Hotel Charlotte on October 26, 1946.

Officers for the coming year were elected as follows:

Chairman: Wyss L. Barker of Allied Chemical & Dye Corporation, Charlotte, N C.; *Vice-Chairman:* John B. Neely of Burlington Mills Corporation, Burlington, N. C.; *Secretary:* Robert H. Smith of Melrose Hosiery Mills, High Point, N. C.; *Treasurer:* Roy J. Beauregard of Fairforest Finishing Co., Spartanburg, S. C.

Sectional Committee: Edwin A. Briggs of Southern Franklin Processing Company, Greenville, S. C.; Wade M. Shanklin of the Pacific Mills, Lyman, S. C.; Fred E. Sprock of the Geigy Company, Charlotte, N. C.; William W. Gluyas of Adams-Millis Corporation, High Point, N. C.

Councilor: L. G. Atkins of Southern Dyestuff Corporation, Charlotte, N. C. Elected for a period of 3 years.

Dean Emeritus D. W. Daniel of Clemson College was the banquet speaker. His speech was entitled "The Looking Glass."

Two technical sessions were held beginning at three P.M. Dr. William F. Luther, Research Associate in Textile Technology, Industrial Institute, University of Chattanooga, spoke on the subject, "Functional Engineering in Textiles." The Hosiery Session was led by Harry White of Se Ling Hosiery Mills, Inc., Nashville, Tennessee; this discussion was entitled "Dyeing of Nylon Hosiery."

Respectfully Submitted,
John B. Neely
Secretary

CALENDAR OF COMING EVENTS

NEW YORK SECTION

Meetings: November 22, January 31, March 7, May 2.

RHODE ISLAND SECTION

Meetings: November 22, January 24, February 28, March 28, April 25. (Providence Engineering Society Hall, 195 Angell Street, Providence.)

PHILADELPHIA SECTION

Meetings: January 17, February 28, April 11, May 23.

NORTHERN NEW ENGLAND SECTION

Meetings: January, March, April, May
Outing: June.
(Dates to be announced)

NATIONAL CONVENTION

Silver Jubilee Convention: December 12, 13 and 14. (Hotel Statler, Boston.)

SUB-COMMITTEES

Meetings: December 12. (Hotel Statler, Boston.)

INTERSECTIONAL CONTEST

December 13. (Hotel Statler, Boston.)

RESEARCH COMMITTEE

Meeting: December 14. (Hotel Statler, Boston.)

EMPLOYMENT REGISTER

This column is open for four insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers, who can obtain further information through the code numbers from the Secretary.

46-5

Education: Lowell Textile School, Night, Chemistry, 1942.

Experience: Hosiery dyeing and finishing.

Age 29; married; references.

46-9

Education: Graduate, Philadelphia Textile Inst., Chem. & Dye.

Experience: Inspector, Quartermaster Corps. Staff Sgt., U.S.A.A.F., Sta. Chief, Meteorology.

Age 24; married; references.

46-10

Education: B. S., Pratt Inst.

Experience: Leather finishing. U. S. Army Medical Corps, Pharmacist, C. W. S. Instructor. Lab. application work on textile chemical specialties. Development of colors in laboratory and pilot plant. Interested in tech. sales service.

Age 31; single.

46-11

Education: PhD. Chem. Engg., Geneva, Switzerland.

Experience: Chief Chemist of Textile Mills, silk and cotton.

Age 57; single; references.

46-15

Education: High school.

Experience: Leather and fur dyeing, 28 years.

Age 52; married.

46-18

Education: graduate Lowell Textile Institute, high standing, 1946.

Experience: two summers in textile plant laboratories.

Age 25; veteran; unmarried.

46-19

Education: R. I. School of Design, night course in chemistry & dyeing.

Experience: Ten years dyeing cotton goods.

Age 29; married; northeast U. S. preferred.

46-20

Education: Chemical Engineer, Helsingfors Univ., and Finland Inst. of Tech.

Experience: Organic chemical research; nearly 20 years head of bleaching, dyeing and finishing dept. handling linen, cotton, jute, etc., in Finland.

Age 46; married; references in U.S.A.

46-21

Education: A.B., Brooklyn College; graduate study, chemistry, N. Y. Univ.

Experience: 1½ years' laboratory control and development work; 1½ years U.S. Army photographic laboratory.

Age 25; single; references.

Applicants who obtain employment should notify the Secretary IMMEDIATELY

Color Lakes

(Continued from Page 538)

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493. 16:3761[2]
494. 28:P177[6]
495. 30:3952[5]
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510. 32:P9514[2]
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514. 35:P2348[3]
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TRADE NOTES • NEW PRODUCTS

• New England Textile Foundation Fund Raising Campaign

George T. Metcalf, Executive Secretary of the New England Textile Foundation, 68 South Main St., Providence, announces that the Foundation will launch a fund raising campaign some time this month. Laurence F. Whittemore, president of Federal Reserve Bank, Boston, has accepted the chairmanship because he feels that "the problem of the New England Textile industry is all of New England's problem."

It is stated that due to the development of new fibers, new finishes, new manufacturing processes and changes in marketing methods, the making and selling of textiles has become an extremely complex operation, involving almost every phase of human knowledge, such as higher mathematics, physics, chemistry, engineering, psychology, sociology, advertising, etc. Only men and women with a special textile education at college level are fitted to cope with many of the technical and executive problems in the industry today. Yet at the present time there is a shortage of 900 textile school graduates.

Lawrence F. Whittemore, chairman, New England Textile Foundation.

The problem is not only one of quantity but also of quality. Handicapped by insufficient funds and indifferent support even from the textile industry itself textile schools throughout the country have been unable to keep pace with textile progress, as regards their curricula, facilities and physical equipment.

To help correct this situation in New England, the New England Textile Foundation was established as a trust on December 5, 1944. The Providence National Bank is the trustee.

This Foundation is a recipient for gifts to be used in the education of future executives and technicians for the New England textile industry. The beneficiaries of these gifts are the textile schools of New England, who receive grants for strengthening faculties and improving equipment,—and high school graduates who wish to pursue a textile career and can pass competitive examinations given by the College Entrance Examination Board and meet other requirements for scholarships. These scholarships may be given each year. 19 were awarded in 1946.

All four New England textile schools are now participating in this program: Bradford Durfee Technical Institute, Lowell Textile Institute, New Bedford Textile Institute and Textile School of Rhode Island School of Design.

In taking this step the New England Textile Foundation is following a trend which has already become well established

in other parts of the country. In the South there is a North Carolina Textile Foundation which has raised $810,000.00 to strengthen the faculty of the textile department of North Carolina State College and another $700,000.00 for a new textile building; also the J. E. Sirrine Foundation which has built a $300,000.000 textile building for Clemson College in South Carolina; while in Georgia the state and its textile manufacturers have contributed $700,000.00 for a new textile building and equipment at Georgia School of Technology; again in Philadelphia the Philadelphia Textile Institute Foundation has raised about $1,000,000.00.

It is stated that, since New England still accounts for 27 per cent of the national textile production, it seems reasonable to suppose that the textile schools in New England merit the same kind of support that textile schools in other sections of the country are now receiving.

While the Foundation is optimistic that this support will be forthcoming, it has decided to set a moderate goal for its first organized campaign,—$250,000.00. This sum will permit only a modest start toward the attainment of its objectives, but it is felt that time will demonstrate the usefulness of its program and that in succeeding campaigns the textile industry and businesses dependent upon it will be glad to give wider and more substantial support.

The Foundation proposes to use capital funds as well as income in the execution of its program. The budget for the expenditure of its first $250,000.00 will be used partly for increasing faculty salaries in the textile schools of New England, partly for purchasing much needed equipment for these schools and partly for scholarships, in accordance with the needs of each school.

Those to be solicited, in addition to textile mills and finishers, it is reported, will include wool dealers, cotton brokers, yarn dealers, textile machinery and supply manufacturers and dealers, dyestuff and chemical manufacturers and dealers, banks, department stores, railroads, public utilities, insurance companies, and commission houses in New York City which have New England interests.

Solicitation will be by mail and by personal contact through voluntary workers recruited from the textile industry and other businesses concerned.

The United States Treasury Department has ruled that gifts made to the Foundation are deductible for income tax purposes, since the Foundation is a non-profit organization devoted exclusively to educational purposes.

The state chairmen appointed to date for the textile mill division will be as follows:—

New Hampshire—*G. K. Ripley, President* of *Troy Blanket Mills, Troy;* Vermont— *W. T. Dewey, V. Pres.* of *A. G. Dewey Co., Quebec;* Massachusetts—*Harold J. Waters, Treas. of Uxbridge Worsted Co., Uxbridge.*

Chairmen of the other divisions already appointed are:—Yarn Dealers—*Arthur E. Snyder* of *Percy A. Legge, Boston;* Textile Machinery and Supply—*George D. Flynn, Jr., Textile Machinery Dealer* of *Providence, Rhode Island;* Dyestuffs and Chemicals—*William R. Moorehouse* of *National Aniline Division of Allied Chemical & Dye Corp., Boston, Massachusetts:* Banks and Insurance Companies—*Lloyd D. Brace, Vice President* of *First National Bank of Boston, Boston, Mass.*

• Atlanta Office, duPont

The Du Pont Company has announced the opening of a new sales office by the Organic Chemicals Department in Atlanta, Ga. The department is composed of the dyestuffs, fine chemicals, rubber chemicals, and petroleum divisions. The new office will distribute and service the products of the dyestuffs and fine chemicals division.

The need for increased facilities in these fields in the South has been indicated for some time, due to the growth of textile, paper and other industries in this area, the announcement said. Up to the present, all sales south of Virginia and east of Arizona have been handled from Charlotte, N. C.

The Charlotte office will concentrate its activities in North and South Carolina, while the rest of the southern district east of Arizona will be handled from Atlanta. It is hoped in this way to increase service to customers, both as to technical assistance and more speedy distribution, the company said. Other activities may be added later as the need grows.

Atlanta was chosen for the site of this new office because it is a business and rail center and a logical shipping point. Stocks of finished products will be carried in both Charlotte and Atlanta.

D. C. Newman, who has been manager of the Charlotte office, will continue as sales manager in charge of the entire southern district with headquarters in Charlotte. A. B. Owens, formerly sales development manager of the dyestuffs division in Wilmington, will be manager of the Atlanta office. R. D. Sloan, connected with the Charlotte office for many years, will be manager of the Charlotte office. Both offices will report to Mr. Newman.

Office space in Atlanta has been taken at 1206 Spring Street. Complete facilities are being installed, including a complete dye application laboratory to render prompt and accurate service on technical problems.

The sales and technical personnel now working out of Charlotte will continue to serve their customers as in the past and will be supplemented by returned service men now in process of training. The facilities and personnel of both offices will be available as needed for the entire district.

This move has been made to anticipate the expected industrial growth in the far South and Southwest, particularly in those chemical consuming industries other than textiles.

• New Synthetic Detergent

The Textile Chemical Division of the Dexter Chemical Corporation announces development of Clavodene, a synthetic detergent which may be used with either rayons, cottons, or wools.

The new product is available in two forms: Clavodene Concentrate, which is 100% liquid synthetic detergent, or as Clavodene No. 100, which is a solution of the Clavodene Concentrate. These products are high molecular weight amine condensation compounds and are recommended by the manufacturers for use as detergents in neutral, mild acid, or alkaline solutions.

Clavodene may be used in the scouring or dyeing of wools or cottons. It is said to have excellent dye-levelling properties and is recommended in both the boiling-off and the dyeing of all types of hosiery. It is also used for wetting-out in many rayon processes as well as in cotton. The addition of a small amount of Clavodene to the kier-boiling of cotton will improve the removal of foreign material and will enable bleaching to be carried out on the kiered goods with a minimum amount of chlorine or peroxide. Clavodene may be used for re-wetting, since it retains its wetting power after drying on the goods.

Clavodene is especially useful in cleaning operations where emulsification and dispersion of spinning waxes or oils are of importance.

Clavodenes are readily soluble in water. The amount of Clavodene used in processing will depend on the particular type of operation. Generally, the Clavodene is claimed to be so powerful that amounts of as little as ¼% of Clavodene Concentrate on the weight of the goods have been found effective.

• Hercules CMC

Hercules Powder Company has announced the commercial manufacture of CMC, a new cellulose derivative. This water-soluble cellulose gum is said to have such a unique combination of properties that in a short time it has found

application in a wide variety of industries including textile, paper, paint, lacquer, ceramics, rubber, cosmetics, and printing.

It is stated that this unusual cellulose gum possesses many properties of water-soluble starches, gelatin, and gums, as well as the additional qualities found in processed or synthesized hydrophillic colloids.

Hercules CMS is the sodium salt of carboxymethyl-cellulose formed by the reaction of monochloroacetic acid with alkali cellulose and is available in three viscosity types:

Low—25 to 50 cps. at two per cent concentration.

Medium—400 to 600 cps. at two per cent concentration.

High—Approximately 2000 cps. at one per cent concentration.

Unlike many chemicals whose uses are circumscribed by specific property limitations, the applications of CMC are said to continue to multiply as chemists study its unique combination of properties and discover new uses for them.

Included among the many properties which make this cellulose gum so interesting and suggest many industrial uses are claimed the following:

It is water-soluble, yet it can be made relatively water insoluble; CMC is adhesive but not sticky; it is insoluble in organic solvents; CMC forms tough films; CMC not only acts as an emulsifying agent in oil-in-water emulsions but it also protects the emulsion.

CMC greatly increases the viscosity of water and it is also possible to carefully control the viscosity of any solution in which CMC is used; CMC is relatively non-hygroscopic both in solution and film; CMC is compatible with many water-soluble materials such as gums, plasticizers, and resins; CMC presents no fire hazard as it chars only at temperatures above 235° C.

In textile manufacture CMC is used in sizes and finishes, as well as for printing pastes, where it is added to the color box.

Although this cellulose gum has been known to Europeans for many years as sodium cellulose glycoate, little of it has been made in the United States until recently.

Hercules Powder Company began extensive tests and pilot-plant manufacture of cellulose gum in 1944. The construction of a large full scale plant in Hopewell, Virginia, for the commercial manufacture of CMC has only recently been completed.

• Sylvania Fellowship

Clinton W. Tasker has for the second time been awarded the Sylvania Division, American Viscose Corporation Fellowship for the study of cellulose chemistry at McGill University, Montreal, Canada.

• Joins I. T. T.

Dr. Woodford G. Sink, a native of Lexington, North Carolina, has joined the staff of the Institute of Textile Technology to work in the field of stream sanitation. He holds the degree of B.A. from Catawba College and Ph.D. from the University of North Carolina (1940).

Following completion of his graduate work Dr. Sink was engaged in research for a year at the Medical College of South Carolina on a grant from the National Research Council. At the conclusion of this work he went to Cannon Mills as textile chemist. Then he entered the teaching field and taught successively at The Citadel, Wittenberg College, and Georgia State College for Women. It is from this latter school that Dr. Sink comes to the Institute.

• Joins H. H. Frede

George M. Schroder, a research fellow of the Industrial Research Institute of University of Chattanooga, has joined the H. H. Frede Company of Chattanooga in order to direct research on the process for bonding cotton fibers which was developed under his direction at the industrial Research Institute.

• Purchase of Hampton Print Works

With the recent purchase of the Hampton Print Works, Easthampton, Mass., the Aspinook Corporation is now the nation's largest textile finishing organization, William A. Broadfoot, president, has announced.

Acquistion of the new plant from the Hampton Company, a Rhode Island Foundation organization, places Aspinook, which specializes in dyeing and printing heavy cotton and rayon draperies, in the dress fabrics finishing field, Mr. Broadfoot said.

Within eight years of its re-organization under new management in 1938, Aspinook has expanded from one idle plant in Jewett City, Conn. to operation of four finishing plants in New England.

In 1941, the firm acquired what had once been the world's largest cotton printing plant, the Lawrence Print Works, Lawrence, Mass., from Pacific Mills.

The Lawrence plant, particularly suited to handle the heavy drapery line which Aspinook featured, was absorbed into the parent firm as a complete bleaching, dyeing, printing and finishing organization.

A year later, the firm's expansion which had been facilitated by employing Aspinook know-how with heavy cotton and acetate fabrics in the Lawrence Print Works, continued with the purchase of the Adams Division of the Arnold Print Works, in Adams, Mass.

Its four New England plants operate 50 printing machines, or 15 per cent of the nation's total adapted for cotton printing.

• German Investigation

Additional information on German-developed pharmaceuticals, dyes and detergents will be gathered by three American experts, the Office of Technical Services, Department of Commerce, has announced.

The investigators, who left for Germany early in September, have been sent by the Allied Chemical and Dye Corp., Buffalo, N. Y. They are: Dr. Jean G. Kern, manager of application research, Dr. Irving T. Thornton, superintendent of planning for the National Aniline Division, and Dr. Bertram M. Helfaer, general superintendent of operations for the same division.

The investigations are directed by OTS' Technical Industrial Intelligence Division. Under the TIID investigation program American companies may send qualified technicians to Germany to study the many materials, processes, and equipment which still remain practically unexplored. The investigators' expenses are paid by their companies, and their reports are distributed by OTS.

• Tropical Deterioration

The results of American wartime research on tropical deterioration, which may prove useful in protecting awnings, shower curtains, and other household furnishings from mildew and mold, are presented in a 294-page report now on sale by the Office of Technical Services, Department of Commerce. In addition to textiles, the report covers technical studies on tropical deterioration of plastics, optical instruments, photographic supplies, and electrical equipment.

The studies were carried out for the War Department, the Office of Scientific Research and Development, the National Bureau of Standards, and other Government agencies. The work was coordinated by the Tropical Deterioration Administrative Committee.

The report describes the methods used for testing, gives recommendations for future work, and contains extensive bibliographies.

This report is entitled *U. S. Tropical Deterioration Administrative Committee, Summary Technical Report* (PB-30483; photostat, $29.50; microfilm, $3.75).

Several other reports on tropical deterioration and allied problems also are on sale by OTS. A recently released report on the fungus inhibitive properties of volatile organic compounds, studied at the Naval Research Laboratory, indicates that at least four compounds are highly satisfactory as volatile fungicides: 2-ethyl-3-propyl acrolein, furfural, ethylchloroacetoacetate, and ethyl thiocyanoacetate. The title of this report is *Fungus Inhibitive Compounds* (PB-23167; photostat, $5; microfilm, $1; 75 pages, including tables and photographs).

Orders for these reports should be addressed to the Office of Technical Services, Department of Commerce, Washington, 25, D. C., and should be accompanied by check or money order, payable to the Treasurer of the United States.

• Director of Dry Cleaning Research

Dr. Dorothy Siegert Lyle, formerly of Pennsylvania State College, has been appointed director of drycleaning research in the clothing and textiles division of the Ohio State University School of Home Economics, Dr. Gladys Branegan, director, announces.

Dr. Lyle, who formerly was senior member of the American Viscose Fellowship at PSC, will supervise all work financed by the Ohio Association of Cleaners and Dyers for special research in fabrics and chemicals.

The association, which plans to build a research unit on the campus for these investigations, is sponsoring a varied program in the field of drycleaning and handling of the many new fabrics on the consumer market.

Dr. Lyle also will direct the educational work involved in the association's efforts to provide retailer and consumer with correct information on the new textiles.

For the past four years, the new OSU staff member worked with Dr. Pauline Bertty Mack, director of the Ellen H. Richards Institute at the Pennsylvania School. Dr. Lyle holds membership in various science and home economics honoraries, including Phi Kappa Phi, Iota Sigma Pi, Sigma Delta Epsilon, and the American Association of Textile Chemists and Colorists.

• Appointed Celanese Chemist

Eugene F. Rogers has been appointed chief chemist of the Chemcel (Texas) plant of Celanese Corporation of America. The appointment was effective as of Oct. 1st.

RICHARD S. HUNTER, formerly specialist in methods of color and gloss measurement at the National Bureau of Standards, who has joined the Henry A. Gardner Laboratory, Inc., at Bethesda, Maryland. As their chief optical engineer, he will develop apparatus and techniques for measuring gloss, reflectance, color turbidity, and other optical properties of materials.

Mr. Hunter is a graduate of George Washington University.

At the Bureau of Standards, which he joined in 1927, he did important research on gloss, its recognition, description and measurement, on reflectometry, and on photoelectric tristimulus colorimetry. He developed a multipurpose photoelectric reflectometer which is widely used to measure the reflectance, color and gloss of reflecting materials. A number of other instruments of his design are applied to various special problems. As his contribution to the war effort, Mr. Hunter developed a simble device for aiming the flashes of sunlight from signaling mirrors used by downed aviators to attract the attention of possible rescurers.

• Why Be a Member?

Dr. D. A. Rochester of the University of Nebraska has the following to say about membership in professional societies and trade associations:

"I do not recall that I have ever known a person who has stood high in his business or profession who has not actively affiliated himself with organizations, attended meetings, and read magazines concerned with his affairs. These seem to be the ways in which people keep up to date and alert to the new things which are going on. I should dislike to trust myself or a member of my family to the care of a physician who does not belong to a medical association, who does not read professional journals, nor go to professional meetings. I would equally dislike to think that my child is being taught by a teacher who has not sufficient interest in her work to secure the information and the inspiration which come from such activities."—From *Rayon Finishers*. Publication of the Silk & Rayon Printers & Dyers Association.

• Monsanto Research Appointments

The appointment of Edward M. Hubbard, Milton Kosmin and Ralph R. Wenner as Group Leaders at the Central Research Department of Monsanto Chemical Company has been announced by Dr. Carroll A. Hochwalt, Central Research Director of the company.

Mr. Hubbard, who received his technical education at the University of Illinois, is in charge of analytical work at Monsanto's Central Research Laboratories. A native of Freeport, Ill., he joined Monsanto at St. Louis in 1939 and was transferred to the firm's Boston laboratories in 1941.

Mr. Kosmin, a native of Chester, Pa., joined Monsanto at Dayton in 1935 after graduating from Pennsylvania State College. He has been engaged in research on several types of organic chemicals and has been awarded a number of patents for original discoveries in this field. In his new position, Kosmin will be responsible for research work on synthetic wetting agents and detergents.

Mr. Wenner, who was born in New York City, attended Cooper Union Institute of Technology, Northwestern University and California Institute of Technology. Before joining Monsanto at Dayton in 1942 he was engaged in chemical and engineering work for several other chemical manufacturers. His specialty is chemical engineering and process development, and he is well known for his original work in chemical thermodynamics. Wenner will be responsible for process engineering and evaluation work at the Monsanto laboratories in Dayton.

• Fiber Chemical Corp.

Fiber Chemical Corporation, formerly Fiber Processing Laboratory, Brooklyn 6, N. Y., has now moved all offices and laboratory to its new plant in Cliffwood, N. J. The Cliffwood plant is built on 2½ acres of ground and modernly equipped with machinery, research and technical laboratory.

Felix F. Axelrad is in charge of the company and has been elected president. Mr. Axelrad has a twenty years experience in processing fibrous materials and is an active member of the American Association of Textile Chemists and Colorists and other scientific organizations. In charge of the research laboratory is Lucien G. White, a graduate of Massachusetts Institute of Technology.

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Tiger Bright BY STONECUTTER

Off the looms of Stonecutter comes this dramatic reproduction, in tissue faille, of a tiger print... another Stonecutter "Fabric of Distinction" that is having breath-taking reception in fine stores and drawing rooms across the country.

Contributing to the stunning effect of Stonecutter fabrics are colors by Sandoz—colors that fulfill the designers' intentions in mood and spirit.

Firms like Stonecutter Mills Corporation also benefit, by having Sandoz among their suppliers, from technical achievements that give them new efficiency in handling. For example: Sandoz' new Pyrazol Fast Blue FLL, a noteworthy addition to their Pyrazol Fast range of fast-to-light direct colors —a blue possessing outstanding fastness to light both before and *after* the urea formaldehyde aftertreatment.

For acid, chrome or direct dyes... or auxiliary chemicals... for both natural and synthetic fibres... be guided by the successful "color achievements" you have been seeing in these Sandoz advertisements. Sandoz application laboratories are located in New York, Boston, Philadelphia, Los Angeles, Charlotte, Toronto, where stocks in wide range are carried. Other branches in Chicago, Paterson and Providence.

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OF SPECIAL INTEREST TO THE TEXTILE INDUSTRY . . .

SULFRAMIN DT and SULFRAMIN LW (Powder) Powerful synthetic detergents and foaming agents unsurpassed wherever hard water presents a problem. LW has a higher lauric content, and consequently is preferred when used in water colder than 50° C. Textile processors and manufacturers of dyeing assistants, use either type, depending upon the temperature of the solution.

SULFRAMIN DH (Paste) A concentrated, slightly alkaline detergent offering great money value as an all around boil-off compound. It is adaptable to the manufacture of various scouring, boiling-off and dyeing assistants; and is usable under any water conditions.

SULFRAMIN DR A neutral compound of high wetting and scouring qualities, having the appearance of a clear, sulphonated oil. It is immediately soluble in hot or cold water, and is therefore an ideal dyeing assistant. It can be employed advantageously as a straight product or in conjunction with various sulphonated oils.

SULFRAMIN DHL A clear, leveling agent having the appearance of a sulphonated oil; and suitable for solving your most vexing dyeing problems. It has powerful leveling and penetrating qualities, and assures complete satisfaction in the processing of rayon and acetate fabrics.

SULFRAMIN DT (Paste) A strictly neutral, synthetic detergent, with good wetting qualities and complete resistance to hard water. Manufacturers of dyeing assistants, and textile processors, use it principally in scouring and dyeing preparations. Being neutral, DT is particularly useful in alkaline solutions.

SULFRAMIN N This is a non-foaming wetting agent, having the appearance of a heavy paste. Although of radically different chemical structure, Sulframin N shares many of the advantages inherent in many of the other Sulframin products. Its strongest feature is its complete immunity to the effects of inorganic acids and alkalies. Consequently, it is preferred in the processing of wool, such as in carbonizing, in dyeing, etc. Not only is Sulframin N an outstanding leveling agent; it can also be safely employed with any amount of alkali.

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STRIPPING COMPOUNDS

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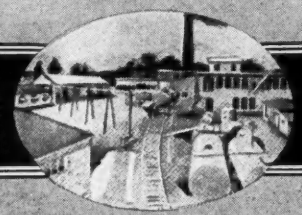
(Calgon Agglomerated)

For years this outstanding product has assisted mills in obtaining peak production in the dyeing and finishing operations.

INSTANTLY SOLUBLE, it saves labor when today labor costs are a chief factor in the ultimate price of a fabric.

For treating pulled wool, hard water conditions, and as a soap saver, CALEX CRYSTALS has no equal.



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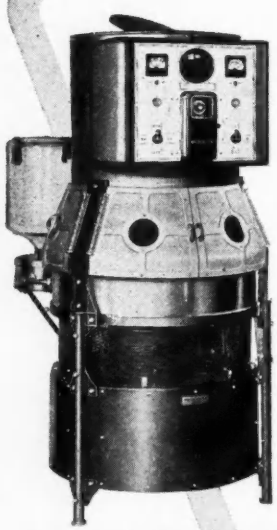

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An indispensible machine for proving the light fastness of dyestuff and fabrics. Fade-Ometer tests are required by many government specifications.
Specimens are rotated around the Atlas Enclosed Violet Arc—the closest approach to natural sunlight. Temperature and humidity regulated—fully automatic in operation—perfectly safe to operate unattended over night.

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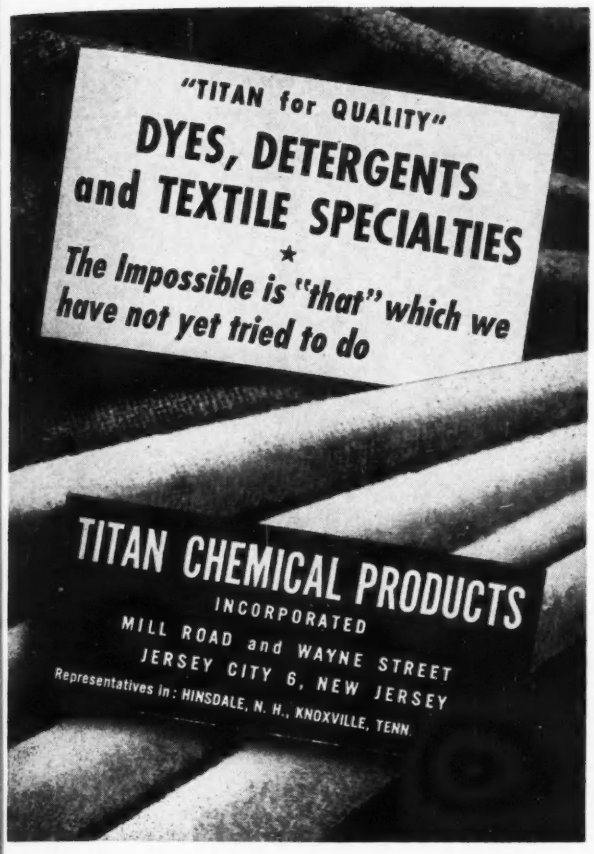
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WHATEVER your own particular finishing problem, scientific tests will show that EXSIZE... our natural enzyme desizer will do the best and most economical job for you.

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CONFIDENTIAL EMPLOYMENT SERVICE — For Dyers, Chemists, Colorists, Mill Managers, Superintendents and others seeking positions and for employers seeking high grade men. Charles P. Raymond Service, Inc., 294 Washington St., Boston, Mass. Over 45 years in business.

WANTED: Colorist, in laboratory of plant manufacturing dyestuffs. Location Staten Island, N. Y. In letter of application please indicate age, experience in detail and education background. Write Box 133.

WANTED: All types dyestuffs, spot and future shipments, including Direct Blacks, Direct Greens, Congo Red, Sulphur Black, Sulphur Blue, Malachite Green, Brilliant Red 12B, Methyl Violet, etc. Write Box 134.

POSITION WANTED: Printing Colorist looks for position as Colorist or superintendent, 16 years experience in every phase of Screen Printing. Write Box 143.

WANTED: SALES REPRESENTATIVE; Nationally known manufacturer of chemical specialties for rayon processing offers unusual opportunity for qualified sales representative in Pennsylvania territory. Must understand throwing, sizing and weaving processes, all types synthetic knitting and weaving yarns, including nylon. Selling and practical mill experience preferred. Give complete information including age, education, training, experience, references. Write Box 141.

POSITION WANTED: Purchasing Agent familiar with textile paper, leather and paint industries, thoroughly familiar with dyestuffs and chemicals desires position where experience and ability are of value. Write Box 140.

WANTED: Chemist for dye-testing laboratory, New York office. Write giving references, salary expected. Write Box 145.

WANTED: PHYSICAL CHEMIST; M.S. or Ph.D.. Experienced. Acquainted with the field of laundry and textile technology, to head research group working on a line of laundry and related products for household use. Furnish complete outline of technical education and experience. Salary commensurate with qualifications. Write Box 146.

WANTED

By Large Machinery Exporter. Dyehouse Machinery and Auxiliary Equipment. Also interested in Complete Units.

Write Box 138.

WANTED: Chemist for dyestuff laboratory. Must be thoroughly familiar with application work, dyeing and screen printing on all fabrics. State experience and salary. Our employees know of this ad. Write Box 147.

POSITION WANTED: Superintendent or Assistant Superintendent of Converting, 18 years experience and Textile School education. Experienced in all lines, excellent background. At present employed, desire a change. Write Box 148.

WE ARE INTERESTED IN BUYING YOUR SURPLUS DYESTUFFS. Write Box 149.

WANTED: Technical Salesman, knowledge of Textile printing and finishing desired. List experience and training. Write Box 150.

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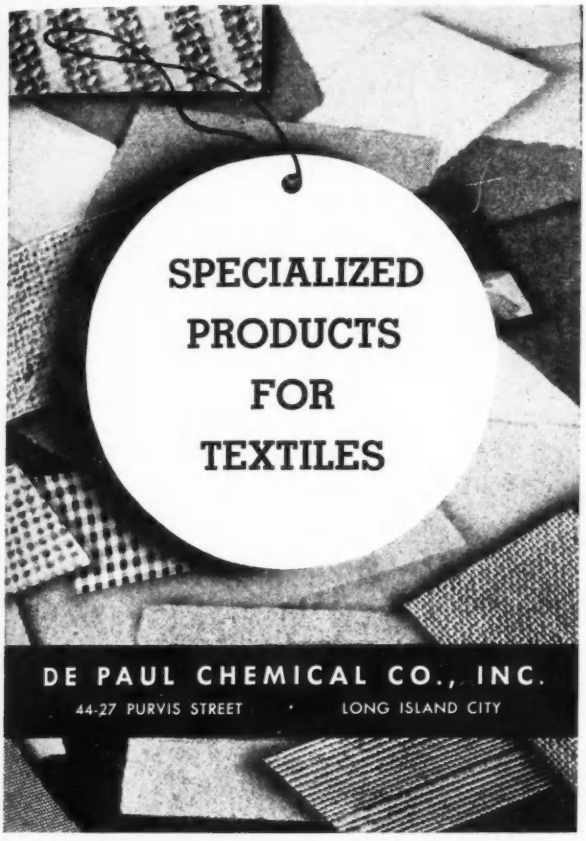

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LYNOL — MEON

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WHICH SHOULD WARRANT ★ YOUR ATTENTION ★

***AQUAROL :** A water repellent for processing woolen, cotton and rayon fabrics, also produces excellent results in splashproofing or finishing all types of hosiery.

***PARAMINE S :** A cation active softener for processing cotton and rayon cloth to obtain a soft, smooth, pleasing finish.

***ALGEPON S :** An assistant in dyeing vat colors to prevent premature oxidation of the reduced bath and eliminate uneven dyeings.

***ALGEPON V A :** Assistant for stripping vat colors—complete reduction of color in stripping bath providing lighter bottom for redyeing.

***PARAPON S A :** A highly efficient leveler and softener for dyeing and finishing all types of yarn, cloth and hosiery to produce a uniform dyeing and a soft full hand.

***ARIPEL F S :** Finish and gas inhibitor for processing dyed acetate rayon—produces a soft full feeling finish and prevents gas fading of the color.

***LANITOL F :** A synthetic detergent possessing exceptional scouring and washing properties for processing wool, cotton, rayon or nylon.

***CULOFIX :** Used as an after treatment in last rinse to prevent bleeding of direct dyed cotton or rayon in water.

***DIAZONOL A C :** For boiling out cotton cloth in pressure or open kiers to produce greater absorbency and cleaner material. Excellent for preboiling knitted cloth in preparation for chlorine bleach. Also used with good results for boiling out cotton or rayon cloth on the jig.

***TETRANOL 1638 :** A rapid wetting and penetrating agent. Active in acid, alkaline and salt solutions and not affected by hard water, may be used in all types of dyeing operations to insure positive penetration of color and a uniform and solid shade.

And a Complete Line of Oils, Chemicals, Softeners and Finishes For Wet Processing All Textile Fibres

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The demand for Soda Ash—as well as the demand for Caustic Soda, Bicarbonate of Soda and Liquid Chlorine—continues to be far greater than the supply; in fact, the situation is even more critical than in May, 1945 when the above advertisement appeared.

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Caustic Soda . Soda Ash . Bicarbonate of Soda
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Products . Synthetic Salt Cake . Dry Ice . Carbonic
Gas . Sodium Chlorite Products . Sodium Methylate

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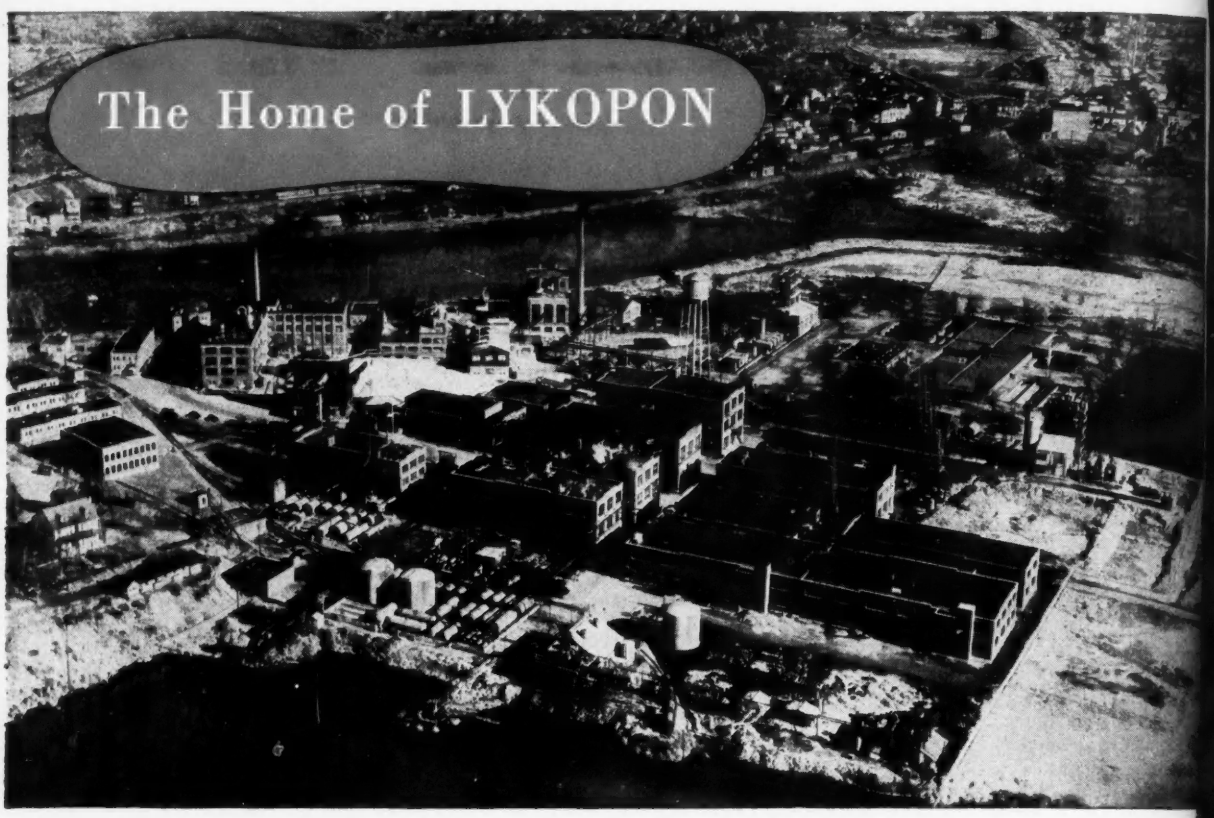

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